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The Journal of Speech and Hearing Disorders

VOLUME 14 DECEMBER, 1949 NUMBER 4

Program, Twenty-fifth Annual Conference, ASHA 289

Conditions under which Stuttering is Reduced or Absent: A Review of Literature — OLIVER BLOODSTEIN 295

To the Stutterer as he Begins his Speech Therapy — C. VAN RIPER 303

Techniques of Therapy for Pre-School Children — JANE BEASLEY 307

Diagnosis and Treatment of a Case of Hysterical Aphonia in a Thirteen-Year-Old Girl — J. L. BANGS AND A. FREIDINGER 312

The Leiter International Performance Scale—A Suggested Instrument for Psychological Testing of Speech and Hearing Clinic Cases — JACK MATTHEWS AND JACK W. BIRCH 318

Russian and English Speech Sounds — C. M. WISE 322

The Relationship Between IQ and Indices of Infant Speech Sound Development — CHARLES C. SPIKER AND ORVIS C. IRWIN 335

The Neurological Evaluation of Delayed Speech — WILLIAM G. PEACHER 344

The Clinical Significance of the Stretch Reflex in Speech Reeducation for the Spastic — PATTI FOTHERGILL AND ROBERT HARRINGTON 353

Voice Breaks and Pathological Larynx Conditions — E. THAYER CURRY 356

Lingual Anomalies Associated with Palatal Clefts — MILDRED FREBURG BERRY 359

Effect of Level of Distracting Noise upon Speaking Rate, Duration and Intensity — T. D. HANLEY AND M. D. STEER 363

Intelligibility Testing in Three Conditions Involving Masking Noise — J. C. KELLY AND M. D. STEER 369

Hearing Aid Amplification for Optimum Speech Reproduction — BOYD V. SHEETS AND LEROY D. HEDGECOCK 373

Book Reviews, 380 Abstracts, 385

News and Announcements, 390

Index to Volume 14, 397

Published Quarterly
by the
American Speech and Hearing Association

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Before submitting manuscripts for publication authors should consult Information for Contributors to the Journal of Speech and Hearing Disorders, *JSHD,* 1949, **14,** 93-94. Prospective authors are invited to write to the Editor for copies of this Note, and of its mimeographed supplement, Examples of Manuscript Form.

The Journal of Speech and Hearing Disorders is published by the American Speech and Hearing Association in March, June, September, and December of each year. Volumes 1-12 appeared under the title *The Journal of Speech Disorders.*

Subscription: $3.50 per year in U.S.A.; $4.00 per year outside U.S.A.; $1.00 per single copy. Entered as second-class matter at the Post Office in Danville, Illinois, under Act of Congress of March 3, 1879. Printed by The Interstate Printers and Publishers, Inc., 19-27 North Jackson Street, Danville, Illinois.

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The Journal of Speech and Hearing Disorders

VOLUME 14 DECEMBER, 1949 NUMBER 4

PROGRAM

Twenty-fifth Annual Conference

of the

American Speech and Hearing Association

Stevens Hotel

CHICAGO, ILLINOIS

The American Speech and Hearing Association will hold its 1949 Convention December 27, 28, 29, and 30, in conjunction with the Speech Association of America, at the Stevens Hotel, Chicago, Illinois.

The meetings of officers and councilors are open to all members.

Short courses are arranged for the partial purpose of providing opportunities for advancement in membership. Credit in the amount of one semester hour is granted for each short course. Attendance at the lecture, an outline of the subject matter presented, and such subsequent bibliographical work as may be assigned by the instructor are the requirements for credits. No fee is charged.

Tuesday, December 27

1:30 p.m. Meeting of Foundations Committee
Meeting of Committee on Academic and Professional Preparation
Meeting of Committee on Credentials
Meeting of Committee on Ethical Practice
Meeting of Committee on Terminology
Meeting of Committee on Association Honors
Meeting of Committee on Constitutional Revision
Meeting of Committee on Exchange of Materials
3:00 p.m. Meeting of Executive Council
7:30 p.m. Meeting of Executive Council
8:00 p.m. First Annual Convention of Sigma Alpha Eta

Wednesday, December 28

8:30 a.m. Registration

GENERAL SESSION
Joint Meeting of SAA, ASHA, AETA, NUEA
Presiding: Horace G. Rahskopf, University of Washington

9:00 a.m. Address of Welcome. *The Honorable Ralph E. Church, U. S. Representative from the Thirteenth Illinois District.*

9:15 a.m. Speech and the Professional Associations. *James H. McBurney, Northwestern University, President SAA.*
9:40 a.m. Our Years Together. *Delyte W. Morris, Southern Illinois University, President ASHA.*
10:05 a.m. Educational Theatre—1949. *Hubert Heffner, Stanford University, President AETA.*
10:30 a.m. Adjournment.

VOICE AND ARTICULATION DISORDERS
Chairman: Loretta Wagner Smith, Brooklyn College

10:40 a.m. Group Therapy for Handling Articulatory Defects at the Elementary Level. *Miriam Keslar, Los Angeles City Schools.*
11:00 a.m. Making the Community Aware of the Need for Speech Correction for the Voice and Articulatory Defective. *Ruth Beckey Irwin, Ohio State University.*
11:20 a.m. What Can the Speech Correctionist Do to Help the Classroom Teacher in Handling the Less Severe Voice and Articulatory Defects? *Margaret E. Hall, Supervisor of Speech Correction, Chicago Public Schools.*
11:40 a.m. The Voice (Film produced by Encyclopedia Britannica). *William J. Temple, Brooklyn College.*
12:00 a.m. Discussion
12:10 p.m. Adjournment

HEARING PROGRAMS: ORGANIZATION AND INSTRUMENTATION
Chairman: Leo G. Doerfler, University of Pittsburgh, School of Medicine

10:40 a.m. Organization of the Medical School Audiology Program. *Herbert Koepp-Baker, College of Medicine, University of Illinois.*
10:55 a.m. A Medical School Speech and Hearing Clinic. *John W. Keys, University of Oklahoma.*
11:10 a.m. Some Principles in the Development of Services for Children with Hearing Impairment. *Arthur J. Lesser, M.D., Chief, Program Planning Section, Division of Health Service, U. S. Children's Bureau.*
11:25 a.m. Ideal Audiologic Testing Room and Equipment Requirements. *Charles E. Harrison, Technisonic Recording Laboratories, St. Louis.*
11:40 a.m. Minimum Audiologic Testing Room and Equipment Requirements. *Merle Ansberry, Veterans Administration.*
11:55 a.m. Some Impressions of Audiology in Europe. *S. Richard Silverman, Central Institute for the Deaf.*
12:10 p.m. Adjournment

12:20 p.m. Alumni Luncheons (Tickets on sale at Information Desk.)

STUTTERING: A TWO-RING CIRCUS ON ITS NATURE, PSYCHOTHERAPY, AND SPEECH THERAPY
Chairman: Charles Van Riper, Western Michigan College of Education.
Panel Members: Robert West, University of Wisconsin
Meyer Solomon, M.D., Chicago
Wendell Johnson, University of Iowa
Conrad Wedberg, University of Southern California
Robert Milisen, Indiana University
Charles Van Riper, Western Michigan College of Education

The panel will be divided into two sections operating simultaneously in different parts of the hall.

2:00 p.m. The Nature of Stuttering.
Panel 1: *West, Johnson, Milisen*
Panel 2: *Van Riper, Wedberg, Solomon*
2:30 p.m. Psychotherapy for Stuttering
Panel 1: *West, Van Riper, Milisen*
Panel 2: *Johnson, Wedberg, Solomon*
3:00 p.m. Speech Therapy for Stuttering
Panel 1: *West, Wedberg, Solomon*
Panel 2: *Johnson, Van Riper, Milisen*
3:30 p.m. Adjournment

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EXPERIMENTAL PHONETICS
Joint Meeting with SAA
Chairman: E. Thayer Curry, University of Illinois

2:00 p.m. An Analysis of Vocal Frequency and Duration Characteristics of Representative Samples of Regional Speech. *T. D. Hanley, Purdue University.*
2:13 p.m. A Technique for the Improvement of Vocal Intensity Variation. *John V. Irwin, University of Minnesota.*
2:26 p.m. A Study of Pharyngeal Palatal Movement. *Harlan Bloomer, University of Michigan.*
2:39 p.m. The Purdue Electronic Pitch Indicator. *M. D. Steer and Gayland L. Draegert, Purdue University.*
2:52 p.m. The Effect on Vocal Frequency and Intensity of Hearing Sustained Tones While Reading. *John W. Black, Ohio State University.*
3:05 p.m. Vocal Pitch of Children. *Grant Fairbanks, University of Illinois.*
3:18 p.m. Discussion
3:30 p.m. Adjournment

BELL TELEPHONE LABORATORIES: THE ACOUSTICAL CHARACTERISTICS WHICH DIFFERENTIATE VOWEL SOUNDS
Chairman: Grant Fairbanks, University of Illinois

3:40 p.m. The Acoustical Characteristics which Differentiate Vowel Sounds (plus sound film). *Gordon E. Peterson, Bell Telephone Laboratories, Inc.*
4:40 p.m. Adjournment

4:50 p.m. ASHA Business Meeting

7:00 p.m. Short Course: Dysphonia
Instructor: Paul Moore, Northwestern University

PANEL DISCUSSION: INSTRUMENTS FOR CLINIC AND RESEARCH PROGRAMS
Chairman: John W. Black, Ohio State University

7:30 p.m. Panel Members: Mildred Berry, Rockford College
Harlan Bloomer, University of Michigan
James F. Curtis, University of Iowa
M. F. Evans, Birmingham—Southern University
Charles E. Harrison, Central Institute for the Deaf
Clarence Haug, University of Wisconsin
John V. Irwin, University of Minnesota
George A. Kopp, Wayne University
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John C. Snidecor, University of California
Mack D. Steer, Purdue University
William Temple, Brooklyn College
Joseph Wepman, University of Chicago
Jane Dorsey Zimmerman, Columbia University
9:30 p.m. Adjournment

8:00 p.m. Meeting of Executive Council

Thursday, December 29

SPEECH CORRECTION IN PUBLIC SCHOOLS
Chairman: Miss Marion Francis, Supervisor of Special Classes, Windsor, Ontario, Canada

9:00 a.m. The Status of Services for Speech and Hearing Handicapped in New England. *Wilbert Pronovost, Boston University.*
9:25 a.m. In-Service Speech Correction Training Programs in Denver Public Schools. *Helen Liggett, Denver Public Schools.*
9:45 a.m. How to Assist, Educate and Cooperate with Classroom Teachers. *Elise Hahn, University of California at Los Angeles.*

10:10 a.m. Flannel Chart Technique for the Rehabilitation of Speech and Hearing Disorders. *Charlotte Wagner and Lucille Enquist, University of Washington.*
10:30 a.m. Adjournment

SPEECH CORRECTION IN PUBLIC SCHOOLS

'The Successful Organization of State Programs of Speech Correction'

Chairman: D. E. Morley, University of Michigan.
Moderator: Romaine Mackie, Specialist, Schools for the Physically Handicapped, Office of Education, Washington, D. C.

10:40 a.m. Topics for Discussion:
State Obligations for a Program; Legislative Procedures; Teacher Training; Provisions for Adequate Surveys and Certifications; Providing for Multiple Handicaps; Planning for Rural Areas; Guidance for Parents; Integration of Available Agencies.

Participants:
Ray Graham, State Department of Public Instruction, Springfield, Illinois
John S. Haitema, State Department of Public Instruction, Lansing, Michigan
Darrel J. Mase, State Teachers' College, Newark, New Jersey
Geraldine Garrison, State Department of Education, Hartford, Connecticut
Elizabeth C. MacLearie, State Department of Education, Nashville, Tennessee
Amy Bishop Chapin, Western Reserve University, Cleveland, Ohio
Ruth Beckey Irwin, Ohio State University

11:40 a.m. Questions and discussion from the floor
12:10 p.m. Adjournment

HEARING AID PROCEDURES

Chairman: S. Richard Silverman, Central Institute for the Deaf

10:40 a.m. Present Status of Hearing Aid Selection for Adults. *Raymond T. Carhart, Northwestern University.*
11:00 a.m. Principles in Hearing Aid Orientation. *Miriam D. Pauls, Johns Hopkins University.*
11:20 a.m. A New Group Hearing Aid for the Profoundly Deaf Child. *C. V. Hudgins, Clarke School for the Deaf.*
11:40 a.m. Binaural Hearing: Implications for Hearing Aids. *Ira J. Hirsh, Harvard University.*
12:00 Discussion
12:10 p.m. Adjournment

THE ASSOCIATIONS LUNCHEON

Joint Meeting of SAA, ASHA, AETA, NUEA
Presiding: James H. McBurney, Northwestern University

12:20 p.m. Eye, Ear, Nose and Throat—The Exercise and Education Thereof. *T. V. Smith, Syracuse University.*

ORGANIC DISORDERS OF SPEECH

Chairman: Jack L. Bangs, University of Washington

2:00 p.m. Techniques for the Improvement of Voice and Speech in Preschool Cerebral Palsy Children. *Mary Huber, Brooklyn College.*
2:15 p.m. Diagnostic Tests for Aphasia. *Joe R. Brown, M.D., and Hildred Schuell, Veterans Administration Aphasia Center, Minneapolis, Minnesota.*
2:30 p.m. A Comprehensive Evaluation of Fifty Cases of Cerebral Palsy. *W. G. Wolfe, University of Texas.*
2:45 p.m. Neuroanatomy Underlying Dysarthria with Suggestions for Differential Diagnosis. *William Peacher, M.D., Syracuse, New York.*
3:00 p.m. Socialization of Aphasic Patients. *D. A. Schultz, Veterans Administration Aphasic Rehabilitation Center, Van Nuys, California.*
3:15 p.m. Discussion
3:30 p.m. Adjournment

CLINICAL PROCEDURES IN HEARING REHABILITATION
Joint Meeting with SAA
Chairman: M. D. Steer, Purdue University

3:40 p.m. The Testing of Hearing for Speech. *James P. Egan, University of Wisconsin.*
3:55 p.m. An Experimental Approach to the Standardization of a Word Discrimination Test. *Jacqueline Keaster, University of Iowa.*
4:10 p.m. Special Techniques in Testing the Hearing of Children. *William G. Hardy, Johns Hopkins University.*
4:25 p.m. Evaluation of a Hearing Test Program in Indiana. *George Shaffer, Purdue University.*
4:40 p.m. No Hearing Loss but a Hearing Difficulty. *Amy Allen, Texas State College for Women.*
4:55 p.m. Life Situation Speech Reading as a Clinical Treatment for the Aurally Handicapped. *Lucelia M. Moore, University of Southern California.*
5:10 p.m. Adjournment

7:00 p.m. Short Course: Dysphonia
Instructor: Paul Moore, Northwestern University

PANEL DISCUSSION: APHASIA
Chairman: Harlan Bloomer, University of Michigan
Panel Members: Ollie Backus, University of Alabama
Joe R. Brown, M.D., Veterans Administration, Minneapolis, Minnesota
Russell Meyers, M. D., University of Iowa, Medical School
W. G. Peacher, M.D., Syracuse University
Hildred Schuell, Veterans Administration, Minneapolis, Minnesota
Donald A. Shultz, Veterans Administration, Van Nuys, California

7:30 p.m. Panel Discussion

8:15 p.m. Meeting of Executive Council

Friday, December 30

CLINICAL PSYCHOLOGICAL TECHNIQUES USED IN SPEECH AND HEARING CLINICS
Chairman: Jack Matthews, University of Pittsburgh

9:00 a.m. The Psychotherapeutic Significance and Limitations of Symptomatic Approaches to Stuttering. *Wendell Johnson, University of Iowa.*
9:15 a.m. A Test for Determining the Mental Imagery Type of Children in the Primary Grades. *Samuel D. Robbins, Emerson College.*
9:30 a.m. Techniques of Personality Exploration. *Kenneth Scott Wood, University of Oregon.*
9:45 a.m. Evaluating Parental Attitudes Toward Children with Speech Defects. *John Wiley, University of Nebraska.*
10:00 a.m. Clinical Psychological Techniques for Screening Speech Cases. *Helmer R. Myklebust, Northwestern University.*
10:15 a.m. Guided Socialization as Therapy in a Speech Clinic. *Charles R. Elliott, Pennsylvania State College.*
10:25 a.m. Discussion
10:30 a.m. Adjournment

SCIENTIFIC BASIS OF HEARING
Chairman: Raymond T. Carhart, Northwestern University

9:00 a.m. Phonemic Regression in Hearing Loss. *John H. Gaeth, Northwestern University.*
9:15 a.m. Recruitment of Speech in Certain Types of Deafness. *C. K. Meyers, U. S. Naval Medical Research Laboratory.*
9:30 a.m. The Present Status of the Fenestration Operation for Otosclerosis. *Lawrence R. Boies, M.D., Minneapolis, Minnesota.*
9:45 a.m. The Relation of Streptomycin and Dihydrostreptomycin to Hearing and the Vestibular Apparatus. *Aram Glorig, M.D., Walter Reed General Hospital.*
10:00 a.m. The Resonances and Impedances of Individual Ears. *Robert F. Pierce, University of Wisconsin.*
10:15 a.m. Discussion
10:30 a.m. Adjournment

VOICE AND ARTICULATION DISORDERS

Chairman: Eugene T. McDonald, Pennsylvania State College

10:40 a.m. An X-Ray Study Comparing Oral and Pharyngeal Structures of Individuals with Nasal Voices and Individuals with Superior Voices. *Ernest Hixon, Sweden, and James F. Curtis, University of Iowa.*

11:00 a.m. An Experimental Investigation of Certain Vocal Frequency and Intensity Relationships Concerning Natural Pitch Level. *Wayne Thurman, Southeast Missouri State College.*

11:20 a.m. Rehabilitation Following Thyroidectomy. *Mary B. Cardozo, Children's Memorial Hospital, Montreal, Canada.*

11:40 a.m. Recent Investigation of the Consistency of Misarticulations in Young Children and Their Relation to Speech Sound Discrimination. *D. Caryl Spriestersbach, University of Iowa.*

12:00 Discussion

12:10 p.m. Adjournment

VISUAL AIDS: PRESENTATION OF A VARIETY OF MOTION PICTURES AND SLIDES WHICH ARE USEFUL IN SPEECH CORRECTION AND AUDIOLOGY

Chairman: Paul Moore, Northwestern University

10:40 a.m. Presentation of Motion Pictures and Slides.

12:10 p.m. Adjournment

12:20 p.m. Luncheon and Business Meeting

2:00 p.m. Meeting of Executive Council

EXPERIMENTAL PHONETICS

Joint Meeting with SAA

Chairman: James F. Curtis, University of Iowa

2:00 p.m. An Experimental Study of the Relationships Between Perception of Vocal Pitch in Connected Speech and Certain Measures of Vocal Frequency. *C. W. Philhour, Jr., Miami University.*

2:15 p.m. An Experimental Study of the Relative Intensities of the Vowels. *Arthur House and Eugene Stevens, University of Illinois.*

2:30 p.m. A Study of the Intensity of Sustained Vowel Sounds. *Bruce Siegenthaler, University of Michigan.*

2:45 p.m. An Experimental Study of Changes in Vowel Identification with Reduced Vowel Intensity. *E. Thayer Curry, University of Illinois.*

3:00 p.m. Intelligibility Related to Voice Variables During Simulated Telephone Transmission. *J. C. Kelly, University of Mississippi.*

3:15 p.m. Discussion

3:30 p.m. Adjournment

VISIT TO UNIVERSITY OF ILLINOIS MEDICAL AND DENTAL COLLEGES FOR CLINICAL DEMONSTRATIONS

(Directions to the University will be provided at registration desk)

Chairman: Herbert Koepp Baker, University of Illinois, College of Medicine

3:00 p.m. Team-Clinics on Cleft Palate and Voice Disorders

Francis L. Lederer, M.D.	Bernard Sarnat, M.D., D.D.S.
Paul H. Holinger, M.D.	Julius B. Richmond, M.D.
Albert H. Andrews, Jr., M.D.	Samuel Pruzansky, D.D.S.
Richard E. Marcus, M.D.	Stanley D. Tylman, D.D.S.
Paul W. Greeley, M.D.	Allan G. Brodie, D.D.S.

5:00 p.m. Adjournment

PROGRAM COMMITTEE

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Loretta W. Smith, Brooklyn College
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Conditions under which Stuttering is Reduced or Absent: A Review of Literature

Oliver Bloodstein

THE literature on stuttering contains references to a very large number of conditions under which the disorder is reduced or eliminated. These conditions are described in reports of research, case reports, and generalizations from clinical observation. Their number and diversity is astonishing, and the reader is likely to receive the impression that the disorder varies unaccountably, almost at random. At the same time, a method of reducing this confusion to order is very nearly suggested by the confusion itself. This suggestion derives from the interesting fact that it is possible to report the conditions under which stuttering is reduced or absent on various levels of generalization. One may say, for example, that stutterers tend to speak more fluently when they whisper (*31*). Or, one may say that they have less difficulty when they speak in almost any odd or unaccustomed way (*40*). Or one may make the still more general inference that stuttering is reduced under any conditions which involve distraction of the stutterer's attention from his speech difficulty (*37*). The more abstract such generalizations become the more useful they probably tend to be as explanatory assumptions. For the immediate purpose of this review of literature, however, it will be sufficient to describe a convenient number of inferences of a relatively low order of abstraction. They are introduced because they permit an orderly classification of most of the material in the literature.

Oliver Bloodstein (Ph.D., Iowa, 1948) is Instructor in Speech, Brooklyn College. This article is based on a portion of a doctoral dissertation completed at the State University of Iowa under the direction of Dr. Wendell Johnson.

Reduced Communicative Responsibility

Eisenson and Horowitz (*12*) make the generalization that stuttering is reduced under conditions in which the stutterer feels little or no responsibility for communicating meanings. They observe that any utterance which does not consist of meaningful units of speech, or 'propositions,' is relatively easy for the stutterer. As examples of such non-propositional utterances they refer to nonsense material and lists of isolated words, and report experimental evidence to show that stutterers tend to have substantially reduced difficulty when reading such material. They also state that certain kinds of memorized material and emotional expressions are often easier for the stutterer because of their low propositional content.

Fletcher (*16*), noting that stutterers rarely have difficulty when they sing, suggests that in singing the stutterer does not feel any responsibility for conveying a message to his listeners through speech. He also states (15) that stutterers tend to talk fluently when acting, when imitating another person's manner of speaking, and when they are alone, for the same reason. West (*49*) remarks that the stutterer is likely to count fluently because he is not 'using words to accomplish conversational ends.' Other con-

ditions under which stuttering appears to be decreased because of reduced communicative responsibility are spelling aloud (*6*), making inconsequential remarks (*36*), repeating words or sentences after someone else (*50*), and speaking to an infant or to an animal (*4*).

Reduced propositionality may also account for the so-called 'adaptation effect.' This is the tendency for stuttering to decrease with successive oral readings of the same passage, which was demonstrated experimentally by Johnson and Knott (*30*) and has been studied for a number of years by Johnson and his students (*27, 39, 51*). It seems reasonable to assume that after the first reading the situation rapidly loses some of its communicative character. Chorus reading is another condition which may belong under the heading of non-propositional speech. Eisenson and Wells (*13*) offer experimental evidence to support their contention that the striking reductions in stuttering usually found when the stutterer reads in chorus are due to decreased communicative responsibility. On the other hand, Pattie and Knight (*34*) report findings which they interpret to contradict this assumption. They impute the effects of chorus reading to another inferential variable shortly to be considered.

Tompkins (*45*) states that the stutterer can easily say what the listener already knows. Various illustrations are to be found in the literature. Bluemel (*6*) reports that the average stutterer speaks more fluently in a store if he can point to the article he wishes to buy, or if he can hand the proprietor a written slip 'ostensibly carried as a memorandum.' Boome and Richardson (*8*) cite the case of a boy who could not say a word when his instructor asked for his address. The moment the instructor found his record card he could give his address without difficulty. Another stutterer was told he could write the answers to several questions if unable to say them. He had to write every answer, but as soon as he wrote it he could say it fluently. Bluemel (*6*) and others report that a stutterer can usually repeat a stuttered word fluently on a second trial, and that he can usually repeat fluently a word which someone pronounces for him by way of assistance. All of these examples probably can be considered to illustrate the effects of reduced communicative responsibility.

Behavior of Listener

Reductions in stuttering are reported to take place under a group of conditions which appear to involve the behavior of the listener as the principal variable. Brown (*9*) observes that a child may stutter severely before one teacher and have no difficulty before another, and Gifford (*21*), finds that a child may stutter when speaking to one parent and not to the other. Research by Porter (*35*) showed that the amount of stuttering which occurred during oral reading before a number of listeners was consistent with the subjects' previous evaluation of the listeners as 'hard' or 'easy.'

The kinds of listener behavior which tend to facilitate the stutterer's speech do not appear to be specifically defined in the literature. The following comments, however, seem to offer some suggestions. A stutterer is quoted by Fletcher (*16*) as saying:

> I have met a few individuals who so completely reinforced me by their very manner that I am able to regain my equilibrium more quickly with them than I can with a snappish, over-business-like, intolerant person.

Another stutterer, in a personal account presented by Greene (*24*), writes:

> Bert is fine, and treats me like a regular fellow. Somehow I trust him; when he is near, a feeling of ease is within me, and I can say a few words without stuttering.

A reasonable assumption may be that the stutterer tends to find it easier to speak to a listener who appears to accept him as an individual rather than to react to him as a stutterer. To put it

more concretely, stuttering tends to be reduced when it does not seem likely that the listener will react to stuttering unfavorably, that is, with impatience, amusement, embarrassment, excessive solicitude, and so forth. The stutterer speaks best when there seems to be no reaction to his stuttering at all.

This hypothesis probably enables us to account for the ease with which many stutterers apparently speak to members of their families (*5*), to close friends (*48*), and to their speech clinicians (*5*). Somewhat oddly, this hypothesis may also help to explain some of the reductions in stuttering which seem to occur in speaking to strangers. Boome and Richardson (*8*) state:

> A stammerer often finds that he can speak more easily to strangers who are not expecting him to stumble, and who will therefore address him normally, than he can to friends and acquaintances who are apt to assume an elaborately unconscious manner when speaking to him.

Finally, it is probably necessary to mention three conditions already referred to in connection with non-propositional speech. When the stutterer speaks to infants, to animals, or to himself, there are obviously no negative reactions to stuttering, except to the extent to which the stutterer has interiorized such reactions.

No Urgency for Favorable Impression

Among the conditions under which stuttering has been reported to be reduced or absent there are several which suggest the interpretation that stuttering is reduced whenever it is less urgent to make a favorable impression on the listener. Many stutterers appear to have little difficulty when speaking to those much younger than themselves (*40*). Many seem to speak quite fluently to persons whom they regard as inferior to themselves, socially or intellectually, for example (*16, 1*), or when giving orders to persons over whom they are in authority (*8*). The fluency with which some stutterers are reported to speak or orate from a public platform is ascribed by Fletcher (*16*), to 'the orator's attitude of leadership, of superiority, of control over his audience.'

Probably the critical point which can be made about all of these situations is that the stutterer feels his status to be sufficiently secure to withstand the consequences of stuttering. There are probably other kinds of conditions under which the motivation to make a favorable impression by fluent speech is weakened. Fletcher (*16*) mentions the stutterer's tendency to speak well when intoxicated, and attributes this to 'indifference to social scrutiny.' For some stutterers there may be less urgency about creating an impression when they speak to people whom they meet for a brief time and never expect to see again. This might partly account for the fluency of some stutterers when they speak to strangers or when they experience a temporary change of environment (*1*).

Change in Accustomed Speech Pattern

The generalization that stutterers tend to speak more fluently when they change their accustomed pattern of speech or voice has already been referred to. A survey of references to reductions in stuttering under such conditions must eventually concern itself with almost every conceivable kind of variation in all of the four 'dimensions' of speech—pitch, time, loudness and quality.

In a laboratory study of the effect of changes in a speech pattern on frequency of stuttering, Johnson and Rosen (*31*) found that the speech patterns which reduced stuttering most effectively were those which involved speaking 'in accordance with some imposed and very definite rhythm'—singing, reading in time to a metronome, reading in time to a swing of the arm, reading in a sing-song manner, reading in unison with another stutterer,

and reading in unison with a non-stutterer. Practically no stuttering occurred in these situations. The remaining speech patterns which they studied, in the order of their effectiveness, were whispering, reading on a high pitch, reading slowly, reading softly, reading loudly, and reading rapidly. All of these except rapid reading reduced stuttering significantly for practically all subjects.

Chorus reading probably cannot be placed in this category without some qualifications. The relative contributions which reduced communicative responsibility and altered speech pattern make to its effectiveness in reducing stuttering has been a matter of dispute. Barber (*2*), in a study of chorus reading 'as a distraction,' found that stuttering was significantly reduced when subjects performed in unison with others reading the same material, with others reading different material, with others reading nonsense material, and with vocal and mechanical noise. Unison reading of the same material, however, produced by far the most striking reduction in stuttering, practically to zero. Barber concluded:

> It would appear from this and from the performance in the remaining situations that the stutterer tends to speak most fluently when his performance is not easily differentiated from the total activity at the moment.

As a further test of this hypothesis Eisenson and Wells (*13*) designed a chorus reading situation in which the stutterer's individual performance could be siphoned off through a microphone to a room where, the subject was told, a small audience was listening to him. The difficulty appeared to be somewhat increased in this situation, and the authors believed that the results

> . . . indicate a likelihood that the stutterer's usual superiority of speech performance in choral situations can be explained by the lack of communicative responsibility generally characteristic of such situations.

Pattie and Knight (*34*), on the other hand, found that when the stutterer read directly to a small audience, chorus reading conveyed to him from another room by telephone was almost as effective in reducing stuttering as the actual presence of the accompanying reader. They concluded:

> The unison reading acts as a pacemaker. The accompanist reads at a regular rate, and the influence of this rate is like the favorable effect of the metronome in experiments in which the subject has to read each work on the beat of the instrument.

In addition to those which have been studied experimentally, there are a great many artificialities of speech pattern which have been reported to result in reduced stuttering on the basis of clinical observation. These include imitating another person's manner of speaking (*1*), imitating a foreign or regional dialect (*47, 48*), using an altered vocal quality (*48*), speaking through closed teeth (*50*), speaking in a monotone (*37*), using unusual inflexions (*48*), using incorrect stress (*33*), speaking in a choppy, staccato manner (*38*), articulating with some degree of exaggeration (*17*), slurring the consonants (*38*), speaking on residual air, or on inhalation instead of exhalation (*7*), employing various abnormalities of breathing (*48*), speaking with mechanical impediments to articulation (*16*), and others.

Speech Accompanied by Bodily Activity

Stuttering is widely reported to be reduced or absent when speech is accompanied by various bodily movements or activities. A great many of these reports deal with the arbitrary bodily actions which stutterers sometimes use to facilitate the attempt on a difficult word. Froeschels (*19*) mentions clenching the fists, looking upward, blinking, bending the head, and turning the eyeballs to one side. Fogerty (*17*) refers to snapping the fingers, Van Riper (*47*) to body jerk and throat clearing, and Fletcher (*16*) to shrugging the shoulders, tapping with

the feet, pinching with the fingers, and whistling. Gutzmann (*26*) speaks of movements of the throat, shaking the head, moving the hands to and fro, thrusting, striking and stamping. Various writers (*17, 19, 22*) find, of course, that these accompanying movements give only temporary relief, losing their effectiveness after a time. And Gutzmann (*26*) and Van Riper (*46*) point out that in the long run the accumulation of outworn movements adds to the total abnormality of the stutterer's speech.

Closely related to these accompanying movements appears to be the stutterer's use of accessory verbalizations. This consists of the meaningless interpolation of extra sounds, words or phrases to facilitate speech. Some examples given by Bluemel (*7*) and Van Riper (*47*) are 'well,' 'say,' 'listen,' 'I mean, 'Don't you know,' 'you see,' 'why,' 'er,' 'um.' Gutzmann (*26*) attributes the effectiveness of such expletives to the fact that they are 'intrinsically nothing more than accompanying movements.'

Not only arbitrary and discrete movements, but also more complex and meaningful activities have been observed to result in reduced stuttering when carried out simultaneously with speech. Fletcher (*16*) states that many stutterers are able to speak fluently while sewing or embroidering, or while playing the piano. Dorsey (*11*) finds that stutterers often speak easily while engaged in athletic activities, for example, when playing tennis or punching a bag. Heltman (*28*) observes that stutterers are likely to have little difficulty while dancing. Ward (*48*) states that stuttering is frequently reduced by the act of speaking and writing simultaneously, and Glassburg (*23*) finds that if the stutterer merely makes a straight line as he pronounces each syllable he will not stutter. Froeschels (*19*) reports that stutterers frequently show marked improvement when they speak while chewing. A study reported by Geniesse (*20*) showed that subjects had markedly less difficulty while walking on all fours. Probably the most striking reductions of stuttering in this group occur when speech is carried on in time to the performance of some rhythmical action. Barber (*3*), in a study of rhythm 'as a distraction in stuttering,' found exceedingly small percentages of stuttering, compared with the percentages in ordinary reading, when subjects read in time to walking, one word per step and one syllable per step, when they read in time to foot tapping, one word per tap, when they read in time to arm swing, one word per swing and one syllable per swing, and when they read in time to hand swing, one word per swing.

Strong or Unusual Stimulation

It seems possible, on the basis of various observations reported in the literature, to make the rather broad generalization that stuttering is often reduced under conditions of very strong or unusual stimulation of almost any kind. Examples most typically reported have to do with excitement (*16*) or intense emotion (*48*). Tompkins (*44*) mentions fluency under conditions of extreme fear, and Blanton and Blanton (*5*) cite instances in which stutterers spoke without difficulty when under fire during World War I. Swift (*43*) notes that stutterers tend to speak fluently when angry and Ward (*48*) believes that probably every adult stutterer can always swear freely. Marked reductions in stuttering have also been observed under conditions of elation or ecstasy (*44*) and in states of hilarity or amusement (*48*), and when the stutterer is carried away by enthusiasm (*25*).

In addition to the normal 'emotions,' various other kinds of intense or unusual sensations are mentioned in connection with reductions in stuttering. These include extreme fatigue (*48*), drowsiness (*48*), the hypnotic trance state (*14*), acute illness (*26*), severe

pain (*5*), electrical stimulation (*26*), and intense hunger (*18*). In a study in which subjects were stimulated with extremely loud noise, Sternberg (*42*) found that stuttering was almost totally eliminated. Finally, it is necessary to mention the effects of various drugs. Reductions in stuttering have been observed to result from anesthetization (*41*), vaso-constriction (*26*), narcosis (*48*), intoxication (already mentioned), sedation (*29*), and the effects of adrenalin (*10*).

Result of Suggestion

One more class of conditions under which stuttering is reduced or absent remains to be discussed. This includes reductions in stuttering due to suggestion. References to this subject in the literature appear to indicate that suggestion, in connection with stuttering, may take a number of forms. The most obvious of these is hypnotic suggestion. As early as the beginning of the nineteenth century it was widely observed that if a hypnotized subject was told that he would speak fluently a marked, if temporary, remission of stuttering often resulted (*26*). A study of hypnotic and post-hypnotic suggestion with stutterers was conducted recently by Moore (*32*), who used the suggestion that 'pauses or hesitancies would come easily and without tension.' Of a total of 40 subjects, Moore found that eight spoke fluently under hypnosis, carried out post-hypnotic suggestions fluently before audiences, and reported that their speech continued to be easy and relaxed for two or three days. Eleven subjects spoke fluently to audiences while under hypnosis and usually carried out post-hypnotic suggestions fluently. Twelve subjects spoke fluently under hypnosis but failed to carry out post-hypnotic suggestions. Hypnosis could not be induced in the remaining nine subjects.

Non-hypnotic suggestion, in its most direct and obvious form, is illustrated by the remarkable feats of Emile Coué in dealing with stuttering. Heltman (*28*) tells that Coué on one occasion

> . . . took a serious stutterer by the hand, led him to the platform, and then, vigorously assuring him that he did not stutter, persuaded him to talk before the audience. This the young man was able to do with no apparent difficulty.

Heltman adds that within a week this person appeared at a speech clinic stuttering more severely than ever.

Fairly straight-forward non-hypnotic suggestions may be given by the stutterer himself. This is well illustrated by Gifford's use of auto-suggestion (*21*) in treating stuttering. Ward (*48*) recommends the reiteration by the stutterer of a verbal formula such as 'I need not struggle,' or 'I am quiet in myself. At the centre of myself there is stillness, repose and quiet,' or 'This is not *my* stammer, for it does not truly belong to speech, which is part of me.'

Non-hypnotic suggestion may also occur in forms which are more disguised and indirect. In fact, Ward (*48*) believes that it is characteristic of suggestion that 'the more indirectly it is given, the more likely it is to succeed,' and that

> . . . by far the most widespread and effective suggestion has been exerted unconsciously, by persons who had no intention of using it but had an unbounded and sincere faith in their . . . drug, instrument, process or 'method.'

Fletcher (*16*), Froeschels (*19*) and Robbins (*37*) believe, likewise, that it is due to the indirect workings of suggestion that stuttering yields in some cases and in some measure to a variety of methods of treatment.

Finally, there appears to be a form of indirect suggestion which is relatively self-induced. This is best exemplified by certain cases of 'spontaneous' recovery from stuttering following a strong expectation on the part of the stutterer that his difficulty would disappear. Heltman (*28*) gives a number of such instances. A boy of 13 stated that if he could leave school to work in a store he would not stutter any more. Permission was granted, the boy

went to work, and his stuttering disappeared. A woman who remarked that she was sure she could overcome her stuttering if she had a schoolroom full of little children to teach later secured such a position, and stopped stuttering. Another case who recovered from stuttering when she enrolled in a course in the fundamentals of speech stated, 'I knew, if I got into that speech class I wouldn't have any more trouble.'

The term 'suggestion,' in summary, seems to label a condition which may be hypnotic or non-hypnotic, direct or indirect, imposed or self-induced, and which has been invoked to account for a wide variety of objective manifestations. Recourse to the word 'suggestion' does not, of course, define the nature of the condition which all of the foregoing examples are alleged to have in common. Ultimately, it appears to be related to the language which the stutterer uses, his assumptions or inferences; to the verbalizations, that is, which he uses in talking to himself, whether consciously or unconsciously, whether accepted ready-made from an outside source or acquired by an equally uncritical process of inference. Thus, Porter (*35*), without using the word 'suggestion,' appears to give a particularly lucid statement of its definition in connection with stuttering when she says that, having formulated his assumptions, the stutterer

> . . . seems to 'project' them on to the situation confronting him, thus reacting not in terms of actualities but in terms of his assumptions or inferences concerning the actualities. Having inferred that a given speech sound or situation is 'difficult,' he appears to act as if it were. . .

And, it might be added, having inferred that speech is 'easy,' he likewise appears to act as if it were.

To complete this review of the literature, it should be mentioned that stuttering has been reported to be reduced or absent when the stutterer is taken off his guard by the necessity for an immediate and quick response (*8*), under conditions of relaxation (*22*), in sleep-talking and delirium (*48*), when speaking a foreign language (*5*), and during recurring fluent 'periods' of various durations (*4*). These conditions are probably not subsumed by any of the generalizations made up to this point. They may be considered in connection with generalizations of a higher order not approached in the present article.

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To the Stutterer as he Begins his Speech Therapy[1]

C. Van Riper

THE tests and interviews with which we tried to explore the nature of your stuttering, its causes and its effects upon you, have pretty well been completed. We have at least a crude idea of the kind of a person and the kind of a stutterer you are. You have met us and have estimated us in a similar fashion. Now that we're acquainted, let's get to work.

The stutterer, entering the speech clinic for the first time, usually goes through a period of bewilderment and confusion. He usually wants free speech immediately, not realizing that a speech defect which has been growing for years cannot be discarded overnight. He is looking for a method of talking without stuttering which he can apply at once. He often will seize upon any trick as the cure-all. He wants someone else to cure him, and to do it quickly. All these desires are natural enough, but they are doomed to be felt in vain.

The stutterer must conquer his own speech problem. No one else can do the job for him. The speech clinic can show him much, can give him the know-how, the guidance, and the opportunity, but only the stutterer can solve his stuttering. It is his responsibility, and his alone.

Many stutterers have little faith in themselves. They have failed so often that they constantly expect to do so again. Their blundering methods of self-help, of following the misguided suggestions of ignorant parents and teachers were doomed to failure from the beginning, but the stutterer does not realize that fact. All he knows is that he has flopped. Many people, friends, family, and strangers have shown by their attitudes that they think he is inferior or weak-willed or to be pitied. Often he has accepted their beliefs and built a personality to fit them, sometimes by becoming antagonistic, sometimes by withdrawing. In this clinic, so far as failing is concerned, we start from scratch. No one enters the clinic as a failure, because the stutterer has not tried our program before. There will be a lot of failing throughout the treatment because no one can succeed immediately in the job of learning or unlearning. But we will have no Failures. The stutterer who works at the job of unravelling his speech defect, who reacts to a momentary defeat by a new and better approach, is bound to succeed.

The only way to fail here is not to try. You say, of course you will try! But each year we have one or two stutterers who work harder at failing than at succeeding, who sabotage our efforts to help them help themselves, who give up and beg for pity or comfort, who sometimes attack us at every occasion, who cheat on their own assignments, who lie and twist at every turn. These people we dismiss from the clinic, first for a week, and then, if the same lack of cooperation and initiative persists, for good. We will

[1]This material has been prepared in order to orient adult stutterers who are beginning clinical work.

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not compare you with others in achievement, only in terms of what you yourself have the possibilities of doing. Self competition is stressed here, not competing with others, whether they be normal speakers or other stutterers. Hoe your own garden!

In addition to the services of the staff of the speech clinic, each of you will be given those of a clinician, a student majoring in speech correction who has had a good deal of experience with other stutterers. This person is not a teacher but an assistant to you. She or he can be invaluable to you in checking your activities, in going with you into difficult situations, in devising methods for accomplishing your goals, in observing your stuttering, in helping you to make friends. Use this person to report your successes and to analyze your mistakes. But do not put on her or him the essential responsibility for correcting your speech.

The speech clinic may at first seem a rather cold and barren place in which you are compelled to face the thing you have always hated—your stuttering. But very soon, unless you are careful, it can become a little harbor and haven in which you feel secure and safe, where stuttering is tolerated. Most of your work should be done in real life situations, in the city itself, in your classes, at your work, on your dates or in your social life. Hunt for challenges, for the difficult situations. Here, we prefer to work on stuttering not by gradually building upward from very easy to difficult situations, but by working on it in the normal situations and under the normal contions of everyday life. Don't make the clinic an escape from life.

About faith. A very few hysterical stutterers seem to be cured by faith alone, at least temporarily. These rare stutterers have been helped by voodoo, by arm-swinging, by hocus-pocus of every sort. We try to avoid this tendency on the part of the stutterer to paint us with absolute faith, hope and charity. We do not save souls. Our feet are full of clay. We have never cured a stutterer. Each person must solve his own speech problem. We know a lot more about stuttering and its treatment than you do—and that is why you have joined our company. Nevertheless, our treatment for stuttering is still far from perfect and there is much about the disorder we still don't understand. Put your faith in yourselves, not in us. There are no miracles in Kalamazoo or anywhere else today. You earn what you get.

About the other stutterers. Some of them may seem much worse than you and some may have many fewer or less peculiar blockings. At first, when they stutter you may feel embarrassed, sorry or irritated by them. They may be feeling the same way about you. All of you will get used to each other before long, and will learn that you can gain a great deal by observing each other. We do not look away when someone stutters. We watch the stutterer and analyze his symptoms. One of our major aims here is to keep from becoming emotional and upset over our stuttering. Work toward this not only when you stutter but when you listen to someone else doing it. In past sessions of the clinic we have had a fine group spirit among the stutterers. You have been a lone wolf in your stuttering long enough. Get acquainted with the others and help them over some of the same rough spots which you will experience.

Beware of false fluency. Every stutterer can speak freely at times, and little good it does him when he finds himself thoroughly stopped. What you need to know is what to do when you are in a feared situation and must say a feared word. You do not need to be taught to speak freely. You already can do that at times. What you need to know is what to do when you get stuck or think you are going to get that way. Some stutterers avoid their moments of stuttering with every possible

bit of ingenuity and energy. Occasionally they are temporarily successful but not in the long run. Murder will out, and so will stuttering. Then let's get the stuttering out in the open where we can attack it and destroy it, rather than ducking and dodging our way through a fluent world. At first you may apparently seem to be getting worse as you give up your trick of avoidance. That, oddly enough, is a good clinical sign. You came here to work on your stuttering. Then why not have some to manipulate, to tear apart. We have never succeeded with stutterers who managed by hook or crook to keep from stuttering in the clinic, or on their assignments.

There are many methods for treating stuttering and many theories about its cause and nature. Why then do we use the methods we do? Simply because to date they seem to us the best ones available. There are many others we have tried and discarded, and probably many others which never have been tried. Since you came to this speech clinic we assume you want what we have to give. We do not feel that our methods are infallible. We have too many failures to account for. But you can be assured of our honesty and interest in your success. We'll do our utmost and expect you to do the same. How long will it take? We don't know you well enough to answer. What are the chances of your success? We don't know you well enough to answer. All we do know is that a good share of our stutterers get good speech, and that they earn it.

We will now outline the therapy. Our basic aim is to teach you *how to stutter, and without obvious abnormality, in a way which does not interrupt the flow of your speech.* If you can do this, it should solve your speech difficulty. It should eliminate most of your fears, both of speaking situations and of difficult words. Free speech then is the by-product rather than the goal of our therapy. We want to teach you how to stutter so quickly, effortlessly, and unnoticeably that your stuttering will be no impediment whatsoever. You probably have observed before this that no two stutterers stutter in exactly the same way. Is there then still another way which has no abnormality in it? We hope to show you.

It would be pleasant for all of us if this big goal could be achieved instantly but our experience shows us that it cannot. You have been stuttering in your present fashion too long. You have strong fears and habits and attitudes which cannot be erased so easily. First of all, we must weaken the old reactions, the long-practiced form of stuttering which you now possess. Right now you stutter automatically, almost involuntarily. You have little control either of your speech or of your emotions. Therefore we must proceed up a long ladder of sub-goals each of which takes you closer to the conquest of your speech defect.

Here is that ladder, beginning with the bottom rung. 1. You must understand the over-all plan of treatment. 2. You must, for the time being, be willing to stutter openly and without embarrassment. 3. You must acquire the ability to keep good eye contact with your listener throughout your moment of stuttering. 4. You must stop avoiding feared words and speech situations. 5. You must stop postponing, half-hearted speech attempts, and retrials. 6. You must be able to analyze your own stuttering in terms of its varying symptoms. 7. You must learn how to cancel. This refers to a technique wherein you go right through your old stuttering block, then pause during which you study the block you have just had, then try the word again in a different way. 8. You must master the principle of negative practice. By this we mean that you must be able to duplicate or initiate at will each typical sample of your own stuttering. 9. You must uncondition or weaken your habitual reactions of approach or release. 10. You must learn how to pull out of your old blocks vol-

untarily, to get them under voluntary control before uttering the word. 11. You must learn how to build barriers against disturbing influences. 12. You must learn how to prepare for the speech attempt on feared words, so that they can be spoken without interruption or abnormality. 13. You must learn to fill much of your speech with voluntary loose movements. 14. You must learn how to reinforce your new fluency each day.

Does this sound like an impossible achievement? If it does it should help to convince you that a real effort is required on your part, that no half measures are going to be successful. Actually, if we climb but one rung of the ladder at a time, it should not be too difficult.

Most stutterers, peculiarly enough, are pessimistic perfectionists. They demand perfection of themselves and yet do not expect it. We of the speech clinic neither demand nor expect perfection. For example, in the second sub-goal mentioned above we ask the stutterer to be willing for the time being (*but not forever*) to stutter openly and without embarrassment. This may strike you as an impossible task. But we are realistic. We do not demand of you that you do this on all words or in all situations or all at once. We ask during this period of therapy that you collect a good many experiences in which you achieve this goal. We will help you to do so by providing the opportunities and the methods. Indeed, your mastery of self control during stuttering will grow throughout the treatment. As you go on to a new task, you will not throw away the control you have previously achieved. You will constantly reinforce it and add additional experiences to fortify it. Let's learn one thing at a time as best we can and work for its complete mastery later.

Thus far we have been outlining the speech therapy. Along with it, there will be a good deal of psychotherapy. Most stutterers have old wounds that ache, and which need opening up and draining if they are ever to heal. Some stutterers have deep-seated emotional problems which require solution. Some of the tests you have had, and many of the conferences you will have, may be devoted to exploring the nature of your emotional conflicts and toward their solution. Old resistances may interfere, but here you may find the counseling service you have long desired.

Finally, we try to help our stutterers become social beings. Some of you already are secure in this area. You date or have wives or many friends. But others of you need this socialization. We shall help you to make these adjustments so far as we are able. We also try to see that each stutterer has some experience earning his living through speech, if only for a short time. Most of our stutterers, whether they need the money or not, require and desire such experiences.

How about it? Shall we begin?

Techniques of Therapy for Pre-School Children

Jane Beasley

ONE of the challenging developments in the field of speech correction has been the increase in inquiries concerning speech problems in children of pre-school age. Many of these represent problems of great seriousness: parents have reported such children as being excluded from group play, showing frustration when speech is not understood, being barred from school because of speech handicaps, and similar difficulties. Parents themselves have exhibited great anxiety which produces further complications.

It was the author's custom earlier to handle these problems on a basis of parental consultation only, without giving direct speech training to the child himself. It became increasingly apparent that such procedure was grossly inadequate. More knowledge was needed than was being secured from reports by parents and observations of the child in an interview setting. Parents needed more help than verbal generalities could give. It seemed clear, then, that the program of research in speech therapy should be enlarged to include investigation at a pre-school level. Such a study was inaugurated two years ago.

Certain basic assumptions were made at the outset of planning this particular study[1]. (1) Speech must be viewed as one aspect of behavior deeply imbedded in the total pattern of behavior of an organism as it engages in interpersonal relationships. This whole-part relationship must be recognized both as a child's speech is studied and as therapy is undertaken. This implies that the part-function of mechanics of speech production should be dealt with *only* within the larger frame of reference of *use* of speech in interpersonal relationships. (2) In speech therapy the job must be considered not only one of motor learning but also one involving reorganization of the whole organism. The function of therapy must be conceived of as helping a child modify his perceptions and behavior so that learning will continue to take place outside the clinical situation. (3) Since 'type of speech disorder' has only limited relevance in determining therapeutic procedures, children with various kinds of speech problems may be handled in a group.

It was decided that the framework of therapy should involve a combination of group and individual instruction for two hours a day over a period of two weeks. Each child should be accompanied by one parent who would attend a group class for parents, would observe the chidren's classes on certain occasions, and would have individual conferences with the speech

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[1]These assumptions grew out of the larger program under the direction of Dr. Ollie Backus at the University of Michigan Speech Clinic.

therapist. The daily program for children has been as follows:

9:45 to 10:00	Informal play
10:00 to 10:30	Group activities
10:30 to 11:00	Individual instruction
11:00 to 11:15	Morning lunch period
11:15 to 11:40	Rhythms and games
11:40 to 12:00	Informal play

To date four such experimental sessions have been held serving a total of 16 children. Some have attended but one session, some have attended two. They have ranged in chronological age from three to six years and have presented a variety of speech problems associated with delayed speech development, cleft lip and palate, birth injury, hearing loss, and complex articulatory involvement. Three main conclusions have been drawn from the study.

1. *Direct study of a child's behavior in various interpersonal relationships with his peers can provide more adequate information on which to base both clinical and home procedures.* In contrast with attempts to handle the child's problems through parent consultation only, a wealth of data is acquired from direct interaction with the child in a teaching situation: his behavior in interpersonal relationships involving other children; his willingness to enter group participation or his preference for engaging in individual pursuits; his over-dependence on adults or other children, or his independent tendencies; his feelings of security; and his flexibility in play roles. In reckoning with the child's assets and limitations, the child's ability to talk readily, if not intelligibly, his use of speech in gaining desired ends, and the means he employs as substitutes for speech, all furnish valuable leads for use in therapy. A number of examples will make more clear the importance of such information.

Jack, during the first interview, communicated only with his mother in monosyllabic vowels. With a clinician he showed only passive interest in play materials, made no sound as he examined the unfamiliar room. As a member of the pre-school group, however, he explored toy cupboards, experimented with play equipment, showed eagerness to participate in group activities. Not only was his behavior evaluated differently, but this active interest was utilized as a means of encouraging speech, and it was possible to give the mother very specific suggestions about how she could encourage his further development along this line at home.

John, in the initial interview, talked at some length about the farm on which he lived. As a member of a group of children, however, he sat in a chair off by himself without demonstrating overt interest in toys or group games. When asked a question he lowered his eyes, shuffled his feet, and shook his head negatively most of the time. This boy needed first of all to have experiences which would arouse in him an impulse to take a part; he needed to find some security and fun in work and play activities with other children before progress in speech could be expected.

Daniel, whose speech was relatively unintelligible, showed reasonably adequate behavior in interpersonal relationships with adults, but among children achieved desired ends by an aggressive role of grabbing what he wanted, striking out at another child, or playing off by himself. Speech training which would begin with such simple responses that this child could feel some success in expressing his needs constituted the first concern for working out his play more satisfactorily.

2. *Direct clinical training can establish a broad base of experience-participation in group activity on which to base both clinical and home procedures.* In these programs of therapy the child's social behavior as a group member, both of his family and of his peers, has been regarded as of first

order importance. First, a group structure has been established of such a nature that it would constitute for each member an environment in which he could feel secure, have a sense of belongingness, and participate in group interaction. The development of such patterns of behavior are conceived of as constituting a ***readiness*** for speech training of a more particularized sort.

It is felt that first of all a child should show or develop a desire to talk. If he has been accustomed to having his needs anticipated, or using only gestures to communicate, he needs to develop some awareness of the function which speech serves, of the pleasurable experiences which speech can bring to him. Events in the clinic must be patterned so there are many opportunities for seeing and hearing that speech effects desired results. During the morning lunch period the child hears each day a question, such as 'What do you want?' and such answers as 'Some milk,' 'A cookie,' 'A napkin,' 'A straw,' along with the responses 'Thank you' and 'You're welcome.' If he is not yet ready to respond verbally, he is not penalized but is given a part in distributing paper plates, collecting cups, and other similar activities. As the experience is repeated day after day, with the speech which some children use freely recognized through praise, other children may begin following suit. One child who had used no speech through the first week during lunch time, on the sixth day used, 'You're welcome' voluntarily. Nothing had been said directly to him about it, but he had observed two boys with whom he liked to play saying it. The existence of a group structure organized to encourage speech in various interpersonal relationships makes it possible to utilize a happening in which the child has a personal interest as a way of promoting speech. Since such speech also constitutes the sort of response which a child has occasion to use at home, at the dinner table, for example; it has value in assisting 'transfer of training' outside the clinical situation. Thus the speech responses that parents are seeking to reinforce at home are the same as those the child has worked on in the clinic.

These therapeutic procedures have implied recognition of the important educational hypothesis that learning proceeds from whole units to part functions. If the child perceives that his use of the phrase 'May I have it?' or 'Give it to me,' gains him a coveted article, there will be meaning associated at the outset with his use of the request. He may be capable of producing only an over-all resemblance of the speech pattern, but if he is doing that much in context with an experience that is pleasurable, he will be better able later to incorporate a particular sound in such a response where the ***meaning*** to him will reside more in the *use* which he makes of the sound than in the production of it.

Ann, who had used gestures or very atypical, unintelligible patterns for designating a need before she came to the clinic, found that she could obtain a number of toys which interested her by use of the statement, 'I want it,' given in a certain manner. She learned very rapidly not only to use the pattern with three syllables in it, but to modify the 'I' so that it resembled a more normal vowel and to use it consistently.

The assumption that the therapist is making use of the child's impulse to speak, beginning with whole speech patterns, implies the need to make use of conversational speech of a sort children use in daily living. In the author's observations, children who are not talking at all, even those who have never passed through a 'babbling stage,' are able to learn responses associated with meaningful experiences. Children with speech involvements different from those of delayed speech also are able to incorporate particular sounds readily in phrase responses

such as 'Fine,' 'I want it,' 'Have one,' 'Up,' 'Down,' 'In the box,' 'By the table,' 'Put it here,' 'Come in,' etc. Frank, for example, began in the first stages of training to work on the [f] because it was present in his name. He was soon able to include the sound in 'Fine.' Neighbors and friends who stopped to ask him how he was or how he liked school were surprised at the progress he was showing when he replied 'Fine,' instead of 'ine,' as formerly. Each such experience outside the clinic reinforced the learning that was taking place.

Transfer of training has appeared to be more effective when children are provided with rich experiences in using a limited number of simple responses. If the response, 'Come,' is taught early, not with attention to phonetic accuracy at first, but with emphasis on use of the pattern, a child can use it first in choosing another child for a game, indicating the children who are to get a cookie, leave the room for their coats, or enter the room after a play period. Later he may enlarge it when playing on a ladder or a slide, going up or down stairs to, 'Come up,' or 'Come down.' When admitting a visitor to the room he may extend it to, 'Come in,' 'Come inside,' 'Come over here,' 'Come to my chair.' Other patterns as, 'Thank you,' 'Thank you, Mary,' and 'Thank you for the cookie,' are useful in numerous ways.

3. *Direct clinical training for children enables parents to gain better understanding of their children, and more insight in how they can give effective assistance to the child at home.* It has become apparent that many of the parents who come seeking advice about their child are parents whose own personal security has been threatened. The neighbors have whispered among themselves about what is 'wrong'; other children have labeled this child 'dumb' or 'funny'; the parents fear he won't be accepted in school, or won't learn; they compare him unfavorably with another child who is liked better; they unconsciously reject him because he poses problems for which they have no ready solution. Through individual and group discussions with parents, and through their directed observation of the therapeutic program, a working relationship between therapist and parent is gradually established which has as a bond the welfare of the child.

Parents can see examples of the importance of considering speech as only one aspect of behavior, of utilizing the child's impulse to speak, of encouraging speech before demanding phonetic accuracy. The conversational patterns which the child is encouraged to use during training represent familiar concepts which the parents can continue to develop after the child leaves the clinic. Most important of all, this type of program provides the parents with 'on the spot' learning experiences so essential for their own reorganization. One final example will illustrate this process.

Dave, who possessed some hearing loss, showed tendencies to direct other children, issue orders, interrupt conversation, and attend to a group task for only very short periods of time. His mother, observing his behavior and contrasting it with others in the group, became disturbed about what she termed his 'badness.' She could be shown within that framework how her child was, in fact, using very appropriate adjustive techniques for a child with a hearing loss. Since he did not hear much of what was going on, he found relatively more security in the role of a leader, which was important for him at that particular stage of development. She could be shown how, with Dave's growth in ability to watch a speaker's facial movements and make use of his residual hearing, he would eventually gain some satisfactions from following in a group, as he did, in fact, during the second session in which he was enrolled. She learned, as well, that since attention from Dave

demanded far more energy than that from other children, he should not be expected to remain at one task for very long. We could have verbalized about these things in conference, but the mother's actual experience with the clinician in observing and interpreting such behavior made her able to go back home and change markedly her attitudes and behavior in relation to the boy. These improvements, in turn, resulted in changes in his own behavior.

In summary, evaluation of these experimental sessions with pre-school children indicates the usefulness of such programs in furnishing opportunity for (1) more extensive observation of the child's behavioral patterns, (2) a broader and richer basis of experience-participation in group activity, (3) a greater functional utilization of the child's impulse to speak, and (4) a more effective means of providing adequate parental guidance.

Letter to the Editor

In a study reported in the *Journal* in December, 1946, Wood presented an articulation index *'based on the relative frequency of occurrence of a given sound . . . it would be a mistake to give two sounds equal value.'* (Italics mine.) For example: The [t] sound gets 12 because it makes up 12 per cent of a child's consonants in speaking, according to Travis. Wood went a step further: 4 for [t] in the initial position, 4 for [t] in the medial position and 4 for [t] in the final position. Why? Because [t] in the initial position makes up 4 per cent of the child's consonants? Not at all, says Wood in a recent article (June, 1949). You really cannot tell exactly what that per cent is, but it probably isn't 4 per cent in conversational speech. That's what I found (*JSHD*, 1948, 13, 233-235) and Wood agrees. So the 'based on the relative frequency of occurrence' has been abandoned at the prorating level.

Why then is the credit of 4 given for [t] in the initial position? Because if a child has learned initial [t], he probably has partially learned medial and final [t], too! So the 12 for [t] is spread around equally and conveniently 4-4-4. Actually in, let us say, a picture test, the child misses medial and final [t] but he has presumably partially learned them. Perhaps; but how much or how little isn't known. I use this illustration because Wood at no time indicates that he has attempted to use his articulation index to analyze what happened in the conversational speech of the children involved. This is interesting because the frequency of occurrence and extent of handicap ideas were both based on frequency of occurrence *in conversational speech.* If you cannot determine initial, medial, and final position definitely in conversational speech, prorating seems to go out of the window for conversational speech except on a 'part credit for possible partially learned' basis. Of course, if one could make a recording of the speech of children and get a board of 'experts' to agree on the points of emphasis, pausing, elision, blending, etc., it might be used. As far as I know, that hasn't been attempted by Wood or by anyone else. Assuming that statistical analyses, however, exact in themselves, cannot produce more exact results than the data on which they are based, I still feel that the conclusions relating to progress in articulation drawn by Wood in his original study are subject to question.

—Ernest H. Henrikson.

Diagnosis and Treatment of a Case of Hysterical Aphonia in a Thirteen Year Old Girl

J. L. Bangs
and
A. Freidinger

RELATIVELY few reports are to be found in the literature which are concerned with hysterical aphonia in children under the age of 15 years. The paucity of such reports may be due to the fact that the disorder seldom occurs in children that young. Jackson and Jackson (*4*) say, 'The disease does not occur in young children and is exceedingly rare before the age of puberty. From this period on the disease may occur at any age.' Lell (*5*) indicates there are seven females afflicted with hysterical aphonia to one male, and the highest incidence is between ages 18 and 34. Walford (*9*) reports a case of functional aphonia in a young boy and states, 'His age of 10 years and 9 months appears to me to make the complaint a somewhat interesting one.'

Though most authors indicate the disorder is common only to the adult age levels, a few have indicated that it is not uncommon among young children. Sachs (*7*) says that hysterical aphonia is very frequent in children and particularly during the period of development. Thomson (*8*) and Winslow (*11*) both state that functional aphonia occurs sometimes in girls as early as eight years of age. Thomson goes on to say that it also occurs occasionally in boys under 10 years of age. Rockford (*6*) states that it is frequent in childhood and recommends the use of the faradic brush over the trachea. Ward (*10*) indicates that hysterical aphonia is most likely to occur in single females at or about the time of puberty. If the disorder does occur frequently among young children, however, authors have failed to report such cases as diligently as they have those occurring in adult individuals.

The discussions of etiology, symptoms, and therapy in cases of functional aphonia among children parallel like discussions concerning the disorder in adult individuals. Babbett (*1*) concludes that 'complex changes of metabolism, variation in endocrines, zymolysis, acidosis, toxemia, etc., may influence functional aphonia.' He notes a triangular separation of the folds posteriorly with good adduction along the anterior two-thirds of the folds as common symptoms of the patient diagnosed as functionally aphonic. He reports a case of a girl 15 years of age with the above symptoms who presented a typical picture of functional aphonia and who remained aphonic for a period of almost three years. The patient received considerable medical treatment, including the use of suggestion and electricity, but remained

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aphonic. He feels that is is extremely difficult to differentiate between organic and functional aphonia because of the complexity of symptomatology in borderline cases and is of the opinion that laryngologists too readily diagnose cases as functional when organic factors are responsible.

Clerf and Braceland (*2*) are of the opinion that the hysterical aphonic transfers his emotional difficulties grossly into the physical or somatic plane (hysterical conversion) and that the symptoms are clearcut and definite, corresponding to the individual's idea of how these disease processes operate. The patient is not concerned about his aphonia because as long as it remains, the emotional problem is effectively repressed.

They discuss a case of a girl, age 15, who lost her voice as a result of a strong dislike for Latin in school. She saved face by her aphonia and was cured by an explanation of the superficial problem and the use of suggestion. The symptoms were typical: the larynx in the mirror appeared normal, cords met on attempted phonation of [i] and [a] and separated before the sound was produced. The cough test revealed normal possibility for adduction, and the onset of the aphonia was sudden.

Gordon (*3*) cites a case of a child who was confined to school and developed a case of aphonia as a reaction to being punished for talking. Gordon feels that the hysterical aphonia in this case was due to excessive fear and guilt which led to repression and inhibition.

Wyatt (*12*) briefly cites a similar case of a boy, age 9½, who lost his voice while reciting during a school festivity. She attributed the aphonia to acute anxieties and personality conflicts.

Though the authors did not make an exhaustive survey of the literature relative to functional aphonia, over 40 articles were read. The 12 articles discussed above were the only ones which mentioned this disorder in children. From this, one may conclude that the disease is relatively unusual in children under 15 years of age.

Case History

The patient was a 13 year old school girl who was referred to the Psychiatric Clinic by the Department of Otolaryngology because of functional aphonia acquired seven years previously. The meager history obtainable from the patient, mother, and stepfather indicated that one day in March, 1940, on returning from school, she was unable to speak above a whisper. No precipitating cause could be found, but several factors appeared in the past and family history which were considered significant.

The father was lazy and irresponsible, and deserted the mother before the patient was born. The stepfather, whom the mother married when the patient was six, had peptic ulcer, was somewhat worrisome and irritable, but made friends easily. The mother was of dull intelligence, had poor insight, often spoke in a weak, hoarse voice, and occasionally could not speak above a whisper when she had a 'cold.'

The birth and early development were considered normal. She slept with the mother until the age of six. At two or three she had temper tantrums. She started to school at the age of five and a half, and in the second grade had trouble with her ears and with the teacher who did not like children. This teacher was irritated with the patient, and insisted she do homework. During that year the patient was restless and unhappy and often had to be forced to go to school. She managed to pass into the next grade in spite of the teacher's threat to the contrary, and thereafter made a progressively better adjustment.

At about the age of six she reported to her mother seeing other children masturbating in school, and the mother warned her of dire consequences if she

did such a thing. Six months before the onset of the aphonia her stepbrother was born, but aside from initial disappointment over his sex, she always seemed very fond of him. Menarche was at 11½ and the mother thought she had adequate preparation.

After the onset of the aphonia she was taken to a number of physicians without success. In June, 1940, while recovering from anesthesia for a tonsillectomy, she talked normally for a short time. After a series of chiropractic treatments she was able to laugh aloud. At times, when excited or startled, she talked aloud. She could whistle, hiccup, and cough normally.

In general, the physical examination was noncontributory. Laryngolic examination showed the epiglottis to be small and curled, and the vocal cords did not approximate well on phonation. There was no inflammation.

Mental examination showed her to be a pleasant, attractive girl of 13 who was superficially cooperative, but shy, and she volunteered no information. Although she said she would like to be able to talk normally, she was quite unconcerned about her symptoms and had no anxiety. Her I.Q. on the Wechsler Bellevue scale was 87.

Attempts were made to obtain more information from the patient, by direct interview and with the aid of intravenous sodium amytal, but the results were most unsatisfactory. Considerable time was then spent in training her as a hypnotic subject; but no additional material was obtained, and a depth sufficient to produce regression was never reached. While under hypnosis her speech could be improved only slightly and there was no carryover on awakening. The above methods of treatment were attempted for about two months with only discouraging results, and the patient was then turned over to the speech therapist, though the general hospital program was continued.

Therapeutic Speech Program

The program of speech therapy was concerned with the development of the following:

1. Individual speech sounds
2. Combining of consonants and vowels
3. Speech for reading
4. Speech for conversation
5. Restoration of apparently flaccid laryngeal musculature

Although the specific speech therapy began with the development of individual speech sounds, at the same time and continuously throughout the retraining program several more general problems were considered and treated. The problems were the restoration of tonicity of the laryngeal musculature and the establishment in the patient of an appropriate mental attitude toward her speech problem. The latter was concerned with factors of motivation and interest in the clinical situation, as well as on the ward.

The laryngeal examination revealed considerable flaccidity of the musculature, from which the speech clinician assumed that five years of disuse of the laryngeal musculature had caused loss of tonicity; consequently, the necessity of developing these muscles was considered of primary importance.

Each speech session was begun with a series of breathing and laryngeal exercises. The most important of these exercises consisted of having the patient inhale deeply, exhale vigorously and stop the exhalation by closing the glottis, while at the same time clenching the fists or lifting lightly on the edge of a table. This procedure was varied at times through the use of coughing exercises. Both techniques require closure of the glottis, with a consequent therapeutic value for the adductors of the vocal folds and the extrinsic laryngeal levators.

The ability to perform these exercises was present from the first, but

normal force and speed of movement was lacking. The cough was not loud and was inclined to become 'breathy' when repeated a number of times. Closure of the glottis was accomplished, but the patient showed a marked inability to maintain this for more than one or two seconds, the adductors quickly relaxing and allowing the air to escape. It was felt that more benefit was derived from rather brief exercise periods, as serious injury might have followed too vigorous exercise of the flaccid musculature.

The problems of motivation and maintenance of interest constantly confronted the clinician. The indifference of the paitent toward her own problem, a recognized factor in the hysterical syndrome, was such that the development of interest was exceedingly difficult. In an effort to provide motivation and interest it was continuously impressed upon the patient that she was actually the one to do the work, while all the clinician did was to guide her. Successes throughout the lessons were praised as being the product of the patient's efforts and ingenuity.

It was felt that more interest could be developed if the patient had at least a rudimentary understanding of her disability and the reasons for the various techniques used during the speech periods. In view of this, portions of the two initial sessions were devoted to an explanation of what had happened to her speech musculature during the five year period of whispering. This discussion, by necessity, was very elementary. The reasons for the flaccidity of her muscles were explained and the whispering, breathy sounds which composed her speech were explained as caused by the inability of her muscles to approximate the vocal folds with sufficient force to produce tone. There is no doubt in this case that the constant attention and time spent in motivation materially aided in bringing the therapy to a successful conclusion. As can be concluded from the discussion to this point, the therapist proceeded on the assumption that the emotional problem or psychic trauma causing the hysterical aphonia had been resolved and that he should treat the aphonia as an organic disorder.

The first lessons devoted to the production of actual sound were concerned only with humming in a soft monotone. This proved surprisingly easy for the patient, though she was unable at first to sustain the tone for longer than three or four seconds. From humming the lessons progressed to the consonants [m], [n], [z], and [v]. As with the monotone, the subject was unable to maintain the consonant sound for longer than four seconds, so considerable time was devoted to breathing exercises. Records of the duration of each sound were compared from day to day. This procedure, besides providing an interest factor, indicated that real progress was being made as the durations increased quite rapidly.

The consonants [m], [n], [z], and [v], and humming were selected by the clinician as the initial sounds to be developed because of the fact that they can be produced with a minimum of effort and require the coordination of the least number of the speech muscles.

With the above accomplished it was felt that the first stage in the therapy had been passed. This represented approximately 30 hours of remedial work over a period of three weeks.

The second stage in the therapy was concerned with the combining of consonant sounds with certain vowel sounds. The initial phase of this step was to have the patient conclude the glottal stop with the vowels [i], [oʊ], or [ɑ]. As soon as she could produce these sounds at will they were combined with the consonants learned. Practice consisted of phonating [noʊ], [nɑ], [ni], [moʊ], [mɑ], [mi], etc. These combinations were learned quite readily, and at this point she was taught the phonetic alphabet.

Progression to words was accomplished by having the patient bring to the lesson each day a few useful words which she particularly wanted to learn to speak aloud. These were printed for her phonetically and articulation achieved by having her produce each phoneme in succession until each word could be pronounced as a unit. The patient was asked to repeat voluntarily each word or sound which she realized had been produced unsatisfactorily. In this manner she was made critical of her own vocalization and often thereafter made spontaneous corrections of individual sounds as well as words which were breathy or whispered.

The transition from individual phonemes and nonsense syllables to words was the hardest period of retraining. The problem consisted essentially of maintenance of interest as the repetitiousness of the lesson periods was conducive to discouragement. Progress was slow but relatively stable in that the patient seldom reverted in the clinical situation to whispering once a word had been successfully produced in its entirety. This second step in the therapy took approximately 10 hours a week for four weeks before it was felt sufficient accomplishment had been made to progress further.

It was now felt that the patient was ready to attempt reading as an intermediate step between vocalization of individual words and conversational speech. The subject matter for reading was of the patient's choosing and consisted of children's books and popular magazines. Though these were probably not the best speech re-education material, it was of interest to the subject and for that reason was used.

During the first few reading lessons it was necessary to have her take a breath between each word. This proved tedious, but progress to short phrases was comparatively rapid. At this point breath control was re-emphasized and breathing exercises intensified. Ability to read aloud was achieved readily, but the voice quality was found to be monotonous. The remedial procedure consisted of breaking sentences up into meaningful phrases in an attempt to force interpretation and achieve inflectional changes. This produced mediocre success until supplemented with vocal exercises consisting of singing and the phonating of vowels with changes in pitch. It was felt the monotone was due to rather slow re-education of the tensors of the vocal folds, for which no specific exercises had been designed. The exercises and interpretative reading acted to reduce the monotonous characteristic quality of her voice and oral reading improved.

In order to develop voluntary control of the laryngeal musculature and to demonstrate to the patient that she now possessed such control of these muscles, she occasionally read by alternately whispering and vocalizing. This seemed quite effective as a motivating technique as she soon grasped the thought that she could now control her own voice at will.

The subject now consistently vocalized when carrying on conversation with or reading to the clinician, but the doctors and nurses reported there was little or no carry-over on the ward. The patient was told this was due to the fact that whispering was a strongly reinforced habit and that this would be very difficult to correct, her success in the clinical situation being due to the fact that the therapist acted to remind her to speak voluntarily rather than habitually. She was asked to concentrate on speaking situations. In order to achieve this she brought each day to her lesson a list of the preceding day's conversational opportunities, which were discussed as to whether they were carried out successfully or failed. As a result of this she was observed by the doctor on the ward to start sentences with whispers but to suddenly break into voiced speech. She explained this to the clinician by saying

that she heard herself whisper and that reminded her to speak aloud.

The transitional period from reading and conversation in the clinical situation to the same in a social position was slow. The nurses, occupational therapists, and the doctors were urged to engage the patient in conversation at every opportunity. Through this medium, therapy was now continued throughout the day, and the subject was soon speaking aloud most of the time.

The final step in her re-education involved placing her in speaking situations of a more complex nature. At this time she was sent to the children's hospital, where she read aloud to some of the younger children who were bedridden. She did this daily for about two weeks with marked success. She was then sent alone to the speech clinic for an arranged interview and later to the city on a shopping tour, in the latter instance accompanied by a nurse. In both rather complex situations the patient succeeded well and was now considered ready for discharge. The entire therapy covered a period of 10½ weeks. Follow-up interviews revealed no new conversion symptoms, and two years following the discharge the patient was still maintaining vocalization.

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The Leiter International Performance Scale—A Suggested Instrument for Psychological Testing of Speech and Hearing Clinic Cases

Jack Matthews
and
Jack W. Birch

THE need for estimating the intelligence of persons with speech and hearing problems is accepted by practically all speech pathologists and audiologists. The adequacy of these estimates is questionable, however, especially when they are based on tests not specifically designed for persons with handicaps of defective speech, hearing loss, or cerebral palsy. Many speech and hearing clinics are currently using scores on group tests as a means of establishing level of intelligence. These scores often are obtained from a nearby public school and seldom is any thought given to the limitations of the testing instruments for speech and hearing cases. True, if the score falls in the range of 'normal I.Q.' there is reasonably good justification for assuming at least average intelligence. If the group test score is low, on the other hand, we cannot be certain that we are dealing with an individual of inferior mentality. The score may be low because of a reading problem associated with a speech defect or hearing loss. The score may be low because the handicapped child may not have been exposed to certain common experiences the test assumes. Add to these possibilities the difficulties associated with faulty administration and it is easy to build a case against the wholesale acceptance of group test results as estimates of the intelligence of cases seen in speech and hearing clinics.

The individual test, although definitely superior for our cases, still has certain weaknesses which will be recognized and properly evaluated by trained psychologists. The responses required in many tests are verbal. Children with speech defects often are very self-conscious about speaking. They will sometimes feign ignorance rather than make a speech attempt that will lead to their embarrassment. Often the responses of a child with defective speech cannot be understood by the examiner. This difficulty is especially noticeable in testing individuals with severe articulatory problems or with delayed speech; both conditions often found in severely involved cerebral palsy cases.

These problems can be overcome in part by making use of tests requiring non-verbal performance. Many such tests, however, depend almost exclusively on verbal directions for administration. For the child with a hearing loss such directions have an obvious weakness. In certain cases, e.g., in delayed speech, speech may be a relatively unimportant entity. A child may

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be habitually inattentive to the speech of others. In certain instances there may actually be a negative reaction to speech. Under any of these circumstances the use of verbal instructions may place the speech and hearing clinic case at a disadvantage; he may not get from the directions of the test an adequate knowledge of what is expected of him.

In the testing of the deaf, attempts have been made to substitute pantomime for verbal instructions. Many psychologists find it difficult to use pantomime. Even when the tester is able to use pantomime freely it is difficult to standardize. From test to test, pantomime instructions given by the same examiner will vary. Variations between examiners likewise will be great.

A clinical tool is needed for estimating the intelligence of children handicapped with speech defects, hearing losses, and cerebral palsy. Such a tool while meeting the usual requirements of objectivity, reliability and validity should also conform to additional specifications. It should not require verbal responses. The instructions should not involve speech or complicated pantomime on the part of the test administrator. The test should be relatively free from time limits and scoring based on speed. The test should impose as little penalty as possible on the handicapped child when he lacks experiences which are commonplace to normal youngsters.

Many of these requirements seem to be met by the Leiter International Performance Scale. Thorough psychological training is a prerequisite to the use of this test as is the case with all other individual psychometric instruments.

In the first publication on standardization of the Leiter Scale (*3*), some clear evidence is given for reliability and validity. Comparisons of average mental ages and average chronological ages suggest good validity. Consistent median I.Q.'s at each age, too, argue for validity, as do standard deviations of 13 to 18 months of mental age at each age level. Another measure of validity, correlation with the 1916 Stanford-Binet, on 76 cases yielded r .79 $\pm$ .08.

The earliest publication (*3*), in 1936, describes the development of the first form of the scale and its standardization in the Territory of Hawaii on 1430 Chinese and Japanese children between 6 and 16 years of age. The test was standardized as an age scale following the general pattern of the most popular Binet standardization. The general purpose was to produce a tool useful in clinical practice with children of widely differing cultural and language backgrounds. This is the group for whom individual Binet-type intelligence tests have produced equivocal results because of their reliance on verbalization and content more common to some cultures than others. This goal was accomplished, according to Arthur (*2*), for she describes the test as 'practically a non-verbal Binet Scale.'

The most complete description of the scale is found in the 1940 manual (*4*). Although 68 separate test items are available, ranging from age 2 to 18, the scale is most applicable to children from 5 to 12 years old. Leiter claims for the scale certain general advantages over tests of the verbal type, such as complete objectivity in scoring, use of more novel test material, and consequent minimizing of the possible influence of environmental factors on test results. More particularly, for children with deafness and speech or language handicaps, the simplicity of administration recommends the scale for clinical use. The intelligence quotients on this scale and Binet-type tests cannot be directly compared because first, the materials of the tests are not equated in difficulty, and second, there are too few available studies showing relationships between in-

telligence quotients obtained on the Leiter scale and other tests of intelligence.

The most recent literature on the test (*1, 2, 7*) refers to Arthur's adaptation of part of the scale for years 2 through 12. This adaptation will result in the major change from an age scale to a point scale, with norms for ages 4.0 to 7.99. Leiter's 1948 revision (*7*) makes use of the same tests as the Arthur adaptation through year 12.

Summarizing available information on this test, the following points recommend it for study in speech and hearing clinics.

1. The author intended to construct a test which would parallel the conventional Binet-type age scales. In the opinions of Porteus and Arthur, he was successful in achieving this goal.

2. Point-scale data will soon be available on the test for ages 4 to 7.99. The present age-scale limits on the test extend from year 2 to year 18. This concentration on the early age range, plus the breadth of the test limits suggest wide applicability of the scale.

3. The test requires no verbalization on the part of the subject or the test administrator.

4. Every item in the scale is performed within the same mechanical framework. No pantomime is necessary. Test items well below the subject's mental age may be used to establish that the subject knows what is expected of him.

5. The few time limits in the test are very generous. The examiner does not need to do precise timing with a stop-watch.

6. The scoring is objective.

7. The materials of the test are interesting to children. They are colorful, varied, and simple. It is possible to stop the test, however, at almost any point if a child should become fatigued or bored and to begin testing again at a later time.

8. The basic task is so simple that even severely physically handicapped children can make the necessary responses. The experiences of the writers suggest that visual impairment is the only physical handicap which is a contraindication to the use of this test. With seemingly inconsequential modifications in technique, the test has been administered to gravely handicapped cerebral palsied children.

Certain cautions and deterrents to immediate and wholesale use of the test should be pointed out. Many of these objections direct attention to needed research by means of this testing instrument. Such research would have the two-fold advantage of adding to general psychological knowledge and establishing the usefulness of the scale. Some of these weaknesses may be listed:

1. Information on the validity of the scale in its present form is quite inadequate both for subjects with and without physical handicaps.

2. The reliability of the scale has not been studied sufficiently to evaluate it from that standpoint.

3. Many of the sub-tests involve building designs from colored blocks. The effect on these items of aberrations in color vision needs investigation.

4. It is necessary to be able to distinguish colors and to recognize pictures of common objects to succeed in certain sub-tests. The relative opportunities of deaf and hearing children to acquire this common knowledge needs to be investigated before one can properly evaluate scores made by the deaf. Similar conditions may prevail for other physically handicapped persons.

5. Many of the sub-tests in the Leiter scale require the subject to construct block patterns or to see analogic relationships between one set of line drawings and another. Workers with brain-damaged subjects recognize these as types of items which frequently present unusual difficulties or

result in unusual responses. Evaluation of the test for brain-damaged subjects is needed.

6. While the test has been administered without great modification in technique to cerebral palsied cases, it is true that some modification has been necessary. Such modifications need to be noted and, wherever possible, standardized so that different clinicians may compare their test results with assurance of like testing conditions.

The purpose of this paper has been to point out present inadequacies in evaluations of mental level of clients in speech and hearing clinics. The lack of applicability of group tests and individual tests currently used has been pointed out. Criteria for usable psychometric tools have been suggested, and an example of how one promising individual scale meets these requirements has been given.

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Russian and English Speech Sounds

C. M. Wise

IT has become a truism that Russia has moved into a position of prominence alongside the United States and Britain. It is a little ironic that a country whose music, theater art and literature have long equalled that of its contemporaries had to become also a major military and political factor before its language as such could be taken seriously. But such is the way world opinion is swayed, and the Russian language is now taking its place among the languages of the world. English-speaking people are now learning Russian at a pace equalled only by that at which Russians are learning English.

English-speaking students studying Russian encounter certain standard difficulties in the pronunciation of the language. Russian students studying English encounter corresponding difficulties in pronouncing English. The following pages undertake to simplify some of these difficulties from the point of view of both types of students.

The main difficulties of the English-speaking student approaching Russian may be enumerated as follows:

1. The pronunciation of non-English sounds in Russian.
2. The two 'aspects' of Russian verbs, viz., the imperfective and the perfective.
3. The arbitrary gender of nouns.
4. The six cases of Russian substantives and adjectives, with endings for masculine, feminine and neuter, singular and plural.
5. The duplication of the functions of the endings through the use of prepositions, much as in Latin, Greek, and German.
6. The lack of any large number of Latin derivatives in Russian, such as prove so helpful in learning Romance languages; and the lack of any large number of easily recognizable words which are cognate with English by reason of common Indo-European ancestors for the Slavic and Germanic roots.
7. Irregular stress.

The first of these items will be taken up in this article.

The main difficulties of the Russian student approaching English may be enumerated as follows:

1. The pronunciation of non-Russian sounds in English.
2. The inconsistent English spelling.
3. The six English tenses, each with its two to three simple, progressive and emphatic forms.
4. The difficulty of distinguishing parts of speech without the aid of identifying endings.
5. The high incidence of idioms in English.
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A word about modern Russian. Of the 16 republics which compose Russia, in only three is Russian spoken with any degree of exclusiveness. These are Russia proper, comprising the northernmost and largest section of Russia in Europe, together with contiguous territory in Asia, where the regional dialect is Great Russian; White Russia, a smaller area adjoining Poland, where the regional dialect is White Russian; and the Ukraine, ly-

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ing along the Black Sea, south of White Russia and Russia proper, where the regional dialect is Ukrainian. Great Russian is spoken by about 100,000,000 people, White Russian by about 5,000,000, and Ukrainian by about 28,000,000 people. In the other republics, Great Russian is known through officials and emigrants, but the native language of each republic is official alongside Great Russian. A Russian three-ruble banknote, for instance, has the words 'Three Rubles' in Great Russian, White Russian, Ukrainian, Armenian, and the languages of three other republics. Stalin himself speaks Great Russian with a slight accent, for he is a Georgian, i.e., a native of Georgia, a small republic in the Caucasus, north of the tiny Armenian Republic and touching the east end of the Black Sea.

While the three Russian regional dialects are mutually intelligible, they do not, unfortunately, use identical alphabets. All three alphabets are derived from church Slavonic, or old Bulgarian, whose ninth century adaptor, Cyrl of Thessalia, took its symbols principally from the Greek, but partly from the Latin. These alphabets differed somewhat among themselves even before the Revolution; but afterwards, when Great Russian discarded two symbols, changed another, and limited the so-called hard sign to a very few instances, White Russian and Ukrainian, which did not follow in these changes, became more conspicuously different to the eye, though there was no added change to the ear.

This article is limited to the Moscow dialect of Great Russian. Being thus limited, it does not agree in every particular with existing treatments of Russian (cf. *1, 2, 3*), but the deviations are not great, and are matters of detail, not of basic significance. The treatment herein is, naturally, considering the purpose of the article, a phonetic treatment rather than a phonemic treatment.

Pronouncing Russian Vowels

It is convenient to separate out from the paired lists in Table 1 the sounds of Russian which are in any way problem sounds to the English-speaking learner.

[ɨ]

Of all vowels, the sound [ɨ] is the most difficult for the speaker of English. It is centralized [i], and normally does not occur in English. Two purely mechanical devices for learning to say it are (a) to clench the teeth and try to say [i], and (2) to thrust the lower jaw forward and try to say [i]. A somewhat more scientific plan is to learn how to centralize the highest part of the tongue arch without the foregoing somewhat face-contorting tricks, as follows:

1. Pronounce [i] before a mirror, being sure that the lips are completely unround, i.e., in a smiling position.
2. With the lips held in the unround position and not permitted to change in the slightest degree, try to say [u]. The tongue will draw back in the mouth and the resultant sound will be the unround [u], the symbol of which is [ɯ]. Now shuttle the tongue backward and forward (with the lips still unround), pronouncing [i—ɯ, i—ɯ, i—ɯ] many times. Finally begin with [i] and slowly draw the tongue backward a little past half-way. The result should be the Russian [ɨ]. Now pronounce [tɨ] (thou), [sɨr̆] (cheese), [ḍɨm] (smoke).

When preceded by a bilabial or labiodental, [ɨ] has a tendency to acquire an on-glide [w], this despite the fact that [w] does not exist as a phoneme in Russian. Thus ['mʍɨłə] (soap), [mwɨ] (we), [bʍɨţ] (to be), [vwɨ] (you).

[ɪ]

The sound [ɪ] is the centralized [ɪ]. It is made with lax tongue muscles, while [ɨ] is made with tense tongue muscles. The position of the tongue for [ɪ] may be found thus:

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TABLE 1. The English and Russian sound systems: Vowels and diphthongs.

English	*Russian Equivalent or Nearest Correspondent*	
i	i	
–	i̯	
–	ii	
–	ɨ	Unstressed member of [i]-phoneme
ɪ	ɪ	Unstressed member of [i]-phoneme
–	ɪi	
ɛ	ɛ	
e	e	Prepalatal member of [ɛ]-phoneme
eɪ	eɪ	
a	a	
aɪ	ai, aɪ	
ɑ	ɑ	Pre-[k,g,x,ɣ,ɬ,] member of [a]-phoneme
æ	æ	Stressed interpalatal member of [a]-phoneme
æ	æi	Interpalatal variant of [ai]
ɔ	ɔ	
–	ɔ̈	Stressed centralized interpalatal member of [ɔ]-phoneme
ɔɪ	ɔi, ɔɪ	
u	u	
–	ui	
–	ʉ	Stressed centralized interpalatal member of [u]-phoneme
ʊ	ʊ	Unstressed member of [u]-phoneme
ʌ	–	
ə	ə	Unstressed member of several phonemes, particularly [a] and [ɔ]
–	əi	
ɜ	–	
ɝ	–	
ɚ	–	

1. Pronounce [ɪ]. The lips will be, of course, unround.

2. Keeping the lips in the same position, try to pronounce [ʊ]. The result will be the unround [ʊ] or [ɤ].

3. Alternate the forward and backward positions of the tongue many times, pronouncing [ɪ—ɤ].

4. Finally, draw the tongue back a little more than half-way between the positions of [ɪ] and [ɤ] for [ɨ].

Example in Russian: [dɨ'ra] (hole).

This sound is found in unstressed positions.

[e]

The sound [e] is a pure or non-diphthongal sound, familiar to students of Romance languages as a common pronunciation of *e*, as in Fr. *été* [e'te] (summer), Sp. *vez* [beθ] (time), It. *credo* ['kredo] (I believe). It is also found in English in certain unstressed syllables, as in *chaotic* [ke'ɑtɪk]. The English speaker must avoid the diphthong by simply omitting the sound [ɪ], holding the tongue and jaw steadily in the position for [e] throughout the length of the vowel. Example: [e̯ eʂ] (all) [de̯ɾ] (day). It appears in prepalatal contexts.

[ɔ]

The sound [ɔ] presents no difficulties in most words, such as [ɔŋ] (he), [gɔr̆ɔt] (city). But after [k], it is rounded so much more than English [ɔ] that it gives the acoustic effect of having an on-glide [w], despite the fact, as indicated earlier, that phonemic [w] does not exist in Russian. Examples: ['kwɔɪf̬i] (coffee), ['kwɔɪʃkə] (cat). Also, [ɔ] before palatal (palatalized consonant or palatal consonant or affricate) develops an off-glide [ɪ]. Examples: [br̆ɔɪf̬] (brow), [dɔɪtʃ] (daughter). (See also the two examples above.) The diphthong here ap-

pears usually in contrast with the regular diphthong in having [ɪ] for the second element instead of [i]. Occasionally, there is a suggestion of [w] between [g] and [ɔ]. But in the Moscow dialect, it is not conspicuous enough for transcription, unless, perhaps, by a diacritic indicating a very round [ɔ]: thus, [ɔ̹].

[a]

The sound [a] is common in English as the first element of the diphthong [aɪ] and of the diphthong [aʊ], but it is less common in isolation. Southern Americans can find examples of [a] alone in the substandard pronunciations [a] and [ha] for *I* and *high*. Easterners can find it in their common alternative pronunciation of *car* and *card* as [ka] and [kad]. Those who know the Romance languages can isolate the vowel of Fr. *la* [la], Sp. *casa* ['kasɛ], or It. *vaso* ['vazo]. Those who have none of these resources, but whose pronunciation of *I* is [aɪ], can simply leave off the[ɪ] of the diphthong. Those whose *I* is [ɑɪ] will have to practice making [a] with the tougue as low in the mouth as possible, and as far front as possible. Examples in Russian: [da] (yes), [ɾu'ka] (hand, arm).

Before an approaching front vowel, as [i], [a] or [ɑ] often diphthongize to [aɪ]. Example: the [ɑ] of bu'mɑgə (paper) becomes [aɪ] in [bumaɪgi] (papers). This diphthong appears usually to contrast with the regular diphthong in having [ɪ] instead of [i] for the second element.

Diphthongs. The fact that the diphthongs [ei], [ai], [æi], [ɔi], and [ui] end in [i] rather than the customary English [ɪ] should offer no real difficulty beyond that of giving overt attention to the rendering of the final element of each diphthong as [i]. Examples: [mu'ʒ̹ei] (husbands'), [tɾam'vai] (tramway), [pɾaj'tʃæiţɪ] (goodbye), ['tɾ̆ɔitsə] (trinity), [dəɾa'gɔi] (expensive), [pətsɪ'lui] (kiss).

Of the diphthongs [ɪi] [ii] and [əi], the only one that presents any difficulty is [ii], which begins with the non-English [i], discussed a few paragraphs earlier. Examples: ['ţicɪi] (quiet, slow), ['vwiiţi] (to leave), ['skɔɾ̆əi] (quick).

The sound [ɛ] becomes quasi-diphthongal by developing an off-glide [ə] in final positions: Examples: [gd̯ɛə] (here), [nəsta'l̯ɛə] (on the table).

Variant Vowels According to Context. It is possible to recognize a fronted [i], or [i˕], a centralized [u], or [u] and a centralized [ɔ], or [ɔ̄]. The [i˕] appears followed by a palatalized or palatal consonant in a stressed syllable, or preceded by a palatal and followed by a palatalized or palatal consonant. The [u] and [ɔ̄] appear between palatals. There are many analogous shadings of vowel value, such as the apparent shift of [ɔ] to [ɛ] in ['skwɔl̯kə > 'skwɛl̯kə]; we shall presently note the shift [a>æ] between palatalized consonants; sometimes new sounds appear for a few isolated instances, such as the [ø[1] < ɔ] in ['løxkɪ] (easy). Most of these are forms of assimilation, and most of them, fortunately, take place automatically by reason of the neighboring sounds in the vocal context.

In the Russian alphabet, which can not be used in this article for lack of proper type, there are vowel characters whose sounds, respectively, are [jɛ], [jɔ], [ju] and [ja]. These, of course, offer no difficulties of pronunciation; but they complicate the pronunciation of preceding consonants, as will be seen.

Pronouncing Russian Consonants

Separating out the Russian consonants in Table 2 which offer the major

[1]The sound [ø] is made by rounding the lips and trying to say [e]. It is the vowel in German *schön* [ʃøn], Fr. *boefs* [bø].

TABLE 2. The English and Russian sound systems: Consonants and affricates.

English	*Russian Equivalent or Nearest Correspondent**	*English*	*Russian Equivalent or Nearest Correspondent**
p	p, p̣	z	z, ẓ
b	b, ḅ	ʃ	ʃ꞉
t	t, ṭ	ʒ	ʒ꞉
d	d, ḍ	–	x, ç
k	k, c (See discussion of [kj]	–	ɣ
g	g, ɟ (See discussion of [gj]	h	–
m	m, m̩	w	w (non-phonemic unstressed variant (1) of [u], (2) after [k] to [ɔ] plus palatal or (3) after [b] or [v] to [i]
n	n̪, n̩		
l	l̪, l		
ɬ	ɬ	ʍ	–
r	ř, r̪, r̆	tʃ	tʃ
f	f, f̣	dʒ	dʒ Rare (1) as voiced variant of [tʃ], (2) in foreign loan-words
v	v, ṿ		
θ	–	–	ts
ð	–	–	dz Rare (1) as voiced variant of [ts], (2) as acoustic equivalent of [ḍ]
s	s, s̩		

*This list includes (1) the 'soft' or palatalized consonants, (2) their variants, and (3) consonants with palatal or labial glides.

difficulties to English speakers, we have the following:

ḅ	m̩	ṛ̌	ʃ꞉	ʃtʃ	ɟ
p̣	n̩	ṛ̆	ʒ꞉	ṭs	
ṭ	ŋ	f̣	x	dz	
ṭ	l̩	ṿ	ç	kj	
ḍ	l̪	s̩	ɣ	c	
ḍ	ř	ẓ	tʃ	gj	

[ṭ], [ḍ], [n̪]

The sounds [ṭ], [ḍ], and [n̪] are, as the diacritics show, dental. That is, they are made with the tongue definitely against the back surface of the upper teeth. Those who know other languages can find these sounds in Fr. *tout* [ṭu] (all), *dos* [ḍo] (back); *nous* [n̪u] (we); Sp. *tomar* [ṭo'mař] (to take), *dos* [ḍɔs] (two), *no* [n̪o] (no, not); It. *tutti* [ṭuṭ꞉i] (all), *dove* [ḍove] (where), *non* [n̪on̪]. Examples in Russian: [ṭam] (there), [ḍřuk] (friend), [n̪ɔʃ꞉] (knife).

[p̣], [ḅ], [ṭ], [ḍ], [m̩], [n̩], [l̩], [ṛ̆], [f̣], [ṿ], [s̩], [ẓ]

The sounds [p̣], [ḅ], [ṭ], [ḍ], [m̩], [n̩], [l̩], [ṛ̆], [f̣], [ṿ], [s̩] and [ẓ] can be handled in a group. They are the Russian palatalized or 'soft' consonants. As a general proposition, they can be said to consist of the ordinary consonants as indicated by their respective symbols, each of which terminates in a closely integrated [j]. When the palatalized consonant is final

in a syllable the [j] is so intimately blended with the consonant proper that it may be said actually to comprise the latter part of it.

This [j] varies a great deal in duration, according to the dialect being spoken. In the Moscow dialect, it is very prominent, for example, in final [ʦ]. In this instance, it is so far front, that the ear of the speaker of English may easily report having heard [ʦs]; in other dialects the effect of [j] in [ʦ] is briefer and less audible. In some dialects, the tongue may seem to make only the gesture of producing [j], without any audible fricative sound. But even so, the Russian ear detects a significant difference between such a palatalized or 'soft' [ʦ] and a non-palatalized or 'hard' [t]. A striking instance of the Russian insistence on the difference between 'soft' and 'hard' consonants appears when a consonant capable of palatalization appears before another palatalized consonant, as in [sɪ'vɔɪdʲnʲə] (today). The palatalization of the [d] seems to the English ear no more than theoretic, yet the Russian feels sure the [d] is 'soft.'

When the palatalized consonant precedes a vowel, the glide effect of [j] is usually prominent in all dialects. As will be seen in the examples presently, the pronunciation of [pʲ] followed by a vowel, for example, is not far removed acoustically from the analogous English pronunciation in a word like *pure* [pjʊr, pjʊə], where the [j] is a conspicuous glide from the [p] to the [u].

Palatalization is effected in Russian by the presence of any of the orthographic symbols whose basic sounds are [i], [jɛ], [jɔ], [ja] or [ju] or of the so-called 'soft sign,' following any of the consonants under discussion. These sounds, together with the 'soft sign,' which is only a diacritic having no sound of it own, may be referred to as palatalizing agents.

While the effect of the palatalizing agents is in general to give a terminal [j]-effect, as has been described, which may be expanded into a glide to the following vowel, there are cases where the effect is either actually or acoustically different. Some of these are as follows:

1. [lʲ] final in a syllable is usually heard as a very clear (front, dental) sound; thus, [l], as in [rubl] (ruble). It is also often heard as [l], when it precedes [i], as in [lʲi'tsɔ] (face).

2. [rʲ] before [i], and as a final, is rather generally heard as a dental trill, as in [r̪is] (rice), [dʲveɾ̪] (door).

3. [dʲ] before [v] and [m] is sometimes heard as [dz], as in [dʲvʏ eɾ̪, dzvʏ eɾ̪] (door); [sɪdʲ'mɔɪ, sɪdz'ɔmɔɪ] (seventh).

4. All of the palatalized consonants tend to lose the acoustic effect of palatalization in unstressed syllables and, as already mentioned, before other consonants in the same syllable, at least to the ear of the speaker of English. But no doubt the Russian speaker often puts his tongue inaudibly through the motions of palatalization, even in such contexts.

Examples of palatalized consonants: [a'tʲ ɛt] (dinner); ['pʲ esnə] (song); ['ʦɛlə] (body); [maʦ] (mother); [dʲeɾ̪ɪvə] (tree); ['mʲ ɛstə] (place); [sʲemʲ] (seven); ['nʲɛbə] (sky); [dʲenʲ] (day); ['lʲɛtə] (summer); ['skwɔlʲkə] (how many, how much)—often heard as ['skwɛlʲkə], because of the [l] (from [lʲ]) closely following; ['r̪umkə] (wine glass); [r̪i'ka] (river); [dʲvʏ eɾ̪] (door); ['fʲ ɛrmə] (farm); [brɔiʃʲ] (brow); ['sʲemʲə] (grain); [sɪ'mʲa] (family); [ʏ esʲ] (all, the whole); [zʲæʦə] (son-in-law's).

In addition to the regular palatalized consonants, the sounds [k] and [g], if followed by a vowel which is a palatalizing agent (*q.v.*), behave much like palatalized consonants. Though they are sometimes said to be in these cases only fronted members ([c] and [ɟ])

of their respective phonemes, the acoustic effect is very much like that of palatalized sounds. But since they are never followed by the 'soft sign,' they are never thought of as palatalized by the Russian speaker. Examples: [kjem] (instrumental case of [ktɔ] (who)), [kjit] (whale), [lɪ-'gjendə] (legend).

[r̆]

The sound [r̆], when not palatalized at the end of a syllable, is very positively and definitely a vigorous tongue-point trill. The substitution of any English [r] is highly unacceptable. Examples: [ɖa'r̆ɔgə] (road), [r̆ɔt] (mouth).

See earlier discussion of [r] and [r̩̆].

[ʃ˕]

The Russian sound corresponding to English [ʃ] in *she* [ʃi] is retracted. Even with front vowels, it is made with the tongue as far back as in *shawl* [ʃ˕ɔl]. Example: ['vɑʃ˕i] (your, yours—plu.). With back vowels, the sound is even farther back. Example: [ʃ˕ɑpkə] (fur cap).

[ʒ˕]

The discussion of [ʃ˕] applies to [ʒ˕]. Examples: ['ʒ˕itɪ̩] (inhabitant), [ʒ˕ɔl] (rascal).

[tʃ]

The affricate [tʃ], like the English [tʃ], varies between a more frontal or a more retracted articulation according to the vowel which follows. Note the variation in English *cheese* [tʃiz], *chalk* [tʃɔk], and in the following examples: [u'tʃitɪ̩l] (teacher) ['tʃɔr̆-nəi] (black—masc. sing.).

In some words, [tʃ] often degenerates to merely [ʃ˕]. Example: [tʃtɔ > ʃ˕tɔ] (what—interrog., that—rel.).

[ʃtʃ]

The discussions above as to fronting and retraction apply to [ʃtʃ]. Examples: [ʃtʃi] (c a b b a g e soup), ['ʃtʃɔtkə] (brush).

In some words, [ʃtʃ] often degenermerely to [ʃ˕]. Example: [ʈa'vaȓɪʃtʃ > ʈa 'vaȓɪʃ˕] (comrade).

[x]-*variant* [ç]

The sound [x] is a voiceless linguavelar fricative, identical with what in German is called the *Achlaut* ['ɑxlaʊt] and in Spanish *jota* ['xotɐ]. To pronounce it the tongue is elevated at the back so as to make a narrow horizontal passage between the tongue and the soft palate, through which the air is forced (the nasal passages being closed at the back by the velum) so as to produce a rough, breathy sound. A speaker of English as yet unfamiliar with [x] may conveniently start with the *Ichlaut* ['ɪçlaʊt], [ç], which occurs in English as a member of the [h]-phoneme. Pronounce *huge* tensely and breathily. The result should be not the theoretically normal [hjudʒ], but [çudʒ], which many speakers of English actually use most of the time. Practice also *Hugh* [çu], *human* [çumən], *Hubert* ['çubə˕t, 'çubət], Now place the vowel [ɪ] before [çudʒ] and pronounce [ɪçudʒ]. Next, leave off [udʒ] and pronounce German *ich* [ɪç] (I). Substitute [ɑ] for [ɪ]. The sound [x] will automatically displace [ç] and the result will be German *ach* [ɑx] (oh). Finally, place [x] in the initial position, as in Russian [xan] (khan). It will now be possible to pronounce Russian words containing [x] correctly, whether the sound is initial or final in the syllable. When this sound appears in Russian adjacent to front vowels, it automatically becomes [ç] The Russian [ç] is usually not as far front as the German or English [ç]. Sometimes it is referred to as a fronted variety of [x]. Examples in Russian: [xɔlm] (hill),

['çimɪk] (chemist), [xl̩ep] (bread), [xʊ'la] (blame).

The sound [x] sometimes appears as a voiceless counterpart of [g], as in [bɔx] (God), which is spelled with a final *g*.

[ɣ]

The sound [ɣ] is a voiced velar fricative, the voiced analogue of [x], made with the same positions of vocal organs. It occurs only seldom. Examples: ['bɔɣə] (God—gen.), ['blɑɣə] (good, welfare).

[ʦ]

The affricate [ts] occurs, of course, in English, as in *eats* [its]. But it is always final in the syllable in English, whereas in Russian it is either initial or final. English speakers sometimes have to strive rather hard to use it in the unfamiliar initial position. Those who know German will have met initial [ts] already, as in *Zeit* [tsaɪt] (time). Examples in Russian: [ʦar̆] (Tsar or Czar), [a'ʦets] (father).

It is impossible, without the Russian orthography before us, to discuss the various ways the several symbols are pronounced. In any case, that is a very long story, and largely beside the point of this article. Two or three statements touching on orthography may be made, however, together with some related statements on stress.

1. Of [a] and [ɑ], [a] is the basic sound. The variant [ɑ] occurs before the back consonants [g], [k], and especially [ɬ]. Examples: [bu'mɑgə] (p a p e r), [sa'bɑkə] (dog), [bɑɬ] (beam), [bɑɬ'kɔn] (balcony). (Note: Most discussions of Russian recognize [ɑ] only before [ɬ].

2. As in English, stress is largely unpredictable, according to present knowledge. In both languages, better definitions of the many subtle guides for stressing for which native speakers have a 'feel' await formulation. Nevertheless in Russian, the pronunciation of most orthographic vowel symbols depends on the stress. Russian recognizes three degrees of stressed syllables: tonic syllables, pretonic syllables and atonic syllables. A tonic syllable is a heavily stressed syllable; a pretonic syllable is a syllable immediately preceding a tonic syllable, and it has secondary stress; an atonic syllable is any other syllable. Some orthographic vowels have three sounds for the three degrees of stressing, some fewer. The orthographic vowel *o*, whose basic sound is [ɔ] (never [o] nor [oʊ] in the Moscow dialect of Russian), is the classic instance. In the example following, each of the three vowels is orthographically *o*; yet each has a different pronunciation, [ɔ] in the tonic syllable, [a] in the pretonic syllable, [ə] in the atonic syllable. Thus, [xəra'ʃɔ] (well).

3. Closely related to stress is, naturally, intonation. It has been studied and described (*3*), but should be heard to be appreciated.[2] It is characterized by interesting rises of pitch in the earlier parts of many clauses, with (to English ears) startling drops at the end below the initial pitch.

4. Regressive assimilation is a very active factor in Russian pronunciation. A normally voiced plosive or fricative preceding a voiceless one becomes voiceless. The sounds [b], [d], [g], [v], [ɣ], [z] and [ʒ] behave in this manner. Example: [ftʃɛ'ra] (yesterday), where the pronunciation [f] is used for the orthographic symbol normally pronounced [v].

A voiceless plosive or fricative preceding a voiced one (except [v]) likewise becomes voiced. Example: [g das'kjeə] (to the blackboard), where the [g] is spelled with the orthographic symbol normally pronounced [k].

5. The sounds [b], [d], [g], [ɣ], [z], [v] and [ʒ] become voiceless when final; i.e., [b] becomes [p], [d]

[2]The Linguaphone Company, Rockefeller Center, New York 20, N. Y., has a set of lessons on phonograph records.

becomes [t], [g] becomes [k], [ɣ] becomes [x], [z] becomes [s], [v] becomes [f], and [ʒ] becomes [ʃ]. Examples:

['muʒə] (husband's)—
[muʃ] (husband)
['lɔʃəd̡ i] (horses)—
['lɔʃət̡] (horse)
['tʃɛxəvə] (Chekhov's)—
['tʃɛxəf] (Chekhov)
['sad̡ə] (of the garden)—
[sat] (garden)
['glazə] (of glass)—
[glas] (glass)
['bɔɣu] (God-dat. sing.)—
[box] (God)
['slɔgu] (syllable-dat.)—
[slɔk] (syllable)
['xl̡ɛbə] (of bread)—
[xl̡ɛp] (bread)

Pronouncing English Vowels

Of the English vowels, the following present problems to the Russian:

ɪ o u ɜ ɚ
æ ou ʌ ɔ

ɪ

It seems surprising that the Russians, having [ɪ] in their own language, should have difficulty with the English [ɪ]. But they do have very great difficulty, their fault being the substitution of [i], so that *ship*, for example, becomes *sheep*. The explanation is that many instances of the English [ɪ] occur in monosyllables and the stressed syllables of polysyllabic words, whereas in Russian [ɪ] never occurs except in an unstressed syllable. The Russian [ɪ], moreover, belongs to the [i]-phoneme. This is another way of saying that Russian [ɪ] is a variant of [i], not a separate phoneme, as in English, and when the Russian thinks of the sound, even in an unstressed syllable, he is thinking of [i]. Accordingly, when he attempts to reproduce it in isolation, he almost inevitably pronounces [i].

Nevertheless, it helps the Russian learner to have [ɪ] pointed out to him in his own language, as in ['mal̡ɪn̡kjɪ] (little-masc. sing.) or [u'tʃit̡ ɪl] (teacher). It helps also to point out that [ɪ] is made with tongue muscles lax, while [i] is made with tongue muscles tense. The difference can be demonstrated by placing the student's thumb and forefinger under the teacher's lower jaw, so that the shift of the musculature from tense to lax can be felt as the teacher pronounces [i-ɪ], *seat* [sit]—*sit* [sɪt], *bead* [bid]—*bid* [bɪd], etc. In fact, there is no better way for the student himself to 'split' [i] and [ɪ] apart than to pronounce pairs like the following:

eat [it]—it [ɪt]
meal [mil]—mill [mɪl]
he's [hiz]—his [hɪz]
mead [mid]—mid [mɪd]
peat [pit]—pit [pɪt]
keel [kiɬ]—kill [kɪɬ]
fit [fɪt]—feat [fit]
bit [bɪt]—beat [bit]
knit [nɪt]—neat [nit]
hit [hɪt]—heat [hit]
rid [rɪd]—read [rid]
hill [hɪɬ]—heel [hiɬ]

[æ]

The sound [æ] likewise occurs in Russian, always between palatalized consonants. But it is a member of the [a]-phoneme, and as such is subject to some of the same difficulties as [ɪ]. Fortunately, however, it occurs in stressed syllables in Russian, and so lends itself to being pronounced in isolation. Examples: [p̡ æt̡] (five), [d̡æ d̡ə] (uncle), ['n̡æ n̡ə] (nurse). It is effective to begin by pairing the Russian words with similar-sounding English words, thus:

[p̡ æt̡]—pat [pæt]
['d̡æ d̡ə]—daddy ['dædɪ]
[n̡æ n̡ə]—Nancy ['næntsɪ]

After [æ] is established, the following list may be used for practice:

add [æd] at [æt]

bad [bæd]	bat [bæt]
lad [læd]	fat [fæt]
sad [sæd]	sat [sæt]
apt [æpt]	act [ækt]
cap [kæp]	fact [fækt]
nap [næp]	tract [trækt]
lap [læp]	cracked [krækt]
am [æm]	lamb [læm]
Sam [sæm]	tram [træm]

[o, ou]

Most Russians learn [o] quite rapidly by beginning with [ɔ], which is their normal pronunciation of orthographic *o*, and rounding the lips more positively. Undiphthongized [o] is infrequent in English, but is generally used in the following, which can be used for practice:

obey [o'beɪ]
omit ['omɪt]
oration [o'reɪʃən]
cooperate [ko'ɑpəreɪt, ko'ɒpəreɪt]

For [ou], the student had best learn [u] in the next paragraph, and then put [o] and [u] together to produce [ou]. If he has difficulty, he may be allowed to use [ou] at first, [u] being more familiar to him. Word list: *old* [ould], *coat* [kout], *most* [moust], *hose* [houz].

[u]

Because [u] belongs to the [u]-phoneme in Russian, and is used only in unstressed syllables, it is difficult for the Russian to produce it in stressed syllables or in isolation. His tendency is, of course, to produce [u]. But it aids him to have [u] pointed out in Russian words such as ['avgust] (August). It is well also to demonstrate that whereas [u] is tense, [u] is lax. By the same process as for [i-ɪ], this can be demonstrated. Then [u] and [u] can be 'split' apart by pronouncing paired words, such as the following:

boom [bum]—book [buk]
boot [but]—put [put]
fool [fuɬ]—foot [fut]
cool [kuɬ]—cook [kuk]
tomb [tum]—took [tuk]
who [hu]—hook [huk]

[ʌ]

British phoneticians *(3)* are able to find the equivalent of the low-back, [ɑ]-like British [ʌ] in certain pretonic syllables where the orthographic vowel is *a*, such as the word for *dog*, which they interpret as [sʌ'bɑkə], but which Americans hear as [sə'bɑkə]. Since the American [ʌ] is very nearly a central vowel, resembling [ə] except for being of longer duration and completely unround, it is best to base its pronunciation on [ə], a sound very familiar to Russians. Therefore, select a word containing [ə], such as ['ɛʈə] (this that—nom. sing. neut.). Pronounce the word with the [ə] greatly lengthened, thus: [ɛʈə:::::]. Repeat with the lips completely unrounded. The result should be a fair approximation of [ʌ]. Caution the student against using [ɑ], which appears to be his most common substitute. To 'split' [ʌ] and [ɑ] apart, have him practice the following pairs:

up [ʌp]—Opp [ɑp, ɒp]
cup [kʌp]—cop [kɑp, kɒp]
cub [kʌb]—cob [kɑb, kɒb]
love [lʌv]—lot [lɑt, lɒt]
above [ə'bʌv]—abolish [ə'bɑlɪʃ, ə'bɒlɪʃ]
son [sʌn]—solve [sɑlv, sɒlv]
judge [dʒʌd ʒ]—job [dʒɑg, dʒɒg]

[ɜ]

The learning of the E., S., Br. [ɜ] may also be based on [ə]. Again have the student pronounce ['ɛʈə:::::]. Let him repeat with the lips slightly rounded. The result should be a fair approximation of [ɜ]. Caution the student against substituting [ɜr̆]. The following will serve for practice:

her [hɜ], not [hɛr̆][3]
bird [bɜd], not [bɛr̆d]
fern [fɜn], not [fɛr̆n]

[3]Throughout these exercises, only one error at a time is considered. Actually the Russian is likely to mispronounce the *h* in *her*.

Since [ɔ] and [ɔɾ̆] are also sometimes substituted, the following practice list may be used:

thirty [θɜtɪ], not [θɔtɪ] nor [θɔɾ̆tɪ]
word [wɜd], not [wɔd] nor [wɔɾ̆d]

[ɝ]

The general American [ɝ] is in some ways easier for Russians to learn than [ɜ]. That is, it is practically automatic for a Russian to use some value of *r* whenever *r* appears in the English spelling. But of course, the Russian's *r* is the tongue-point trill, vigorous and prominent. Along with teaching him the value of the vowel [ɝ], must go the suppression of the trill. It has proved reasonably successful for the teacher to draw diagrams of the tongue with the point elevated toward, but not touching, the middle of the hard palate, and to demonstrate this tongue position with his own tongue. When the student adds to the vowel [ɜ], as described above, the quality arising from the elevated tongue position, a passable [ɝ] should result. But [ɜ] and [ɝ], like most central vowels, are difficult for foreigners to learn. Much patience and repetition is necessary Since [ɛɾ̆] and [ɔɾ̆] are common substitutes, the following will serve for drill.

concern [kən'sɝn], not [kən'sɛɾ̆n] nor [kən'sɔɾ̆n]
pearl [pɝɬ], not [pɛɾ̆l] nor [pɔɾ̆l]
whirl [ʍɝɬ], not [ʍɛɾ̆l] nor [ʍɔɾ̆l]
work [wɝk], not [wɛɾ̆k] nor [wɔɾ̆k]
journal ['dʒɝnəɬ], not [dʒɛɾ̆nəl] nor ['dʒɔɾ̆nəl]

[ɚ]

Once having learned [ɝ], the Russian often can achieve a passable [ɚ] by shortening and relaxing [ɝ]. Or he can apply to his well known [ə] the elevated tongue position described above for [ɝ]. The most frequent substitution is [ɛɾ̆]. Words for practice:

reader ['ridɚ], not ['ɾidɛɾ̆]
border ['bɔrdɚ], not ['bɔɾ̆dɛɾ̆]

Pronouncing English Consonants

Of the English consonants, the following present problems to the Russians:

t	ŋ	ð	h	tʃ
d	r	ʃ	w	dʒ
n	θ	ʒ	ʍ	

[t], [d], [n]

The sounds [t], [d], and [n] are alveolar in English, not dental, as in Russian. The student must be taught by diagram and personal demonstration to place the tip of his tongue on the alveolar ridge, back of the upper front teeth, not against the teeth themselves. Words for practice:

net [nɛt], not [nɛt̪]
den [dɛn], not [dɛn̪]
gnaw [nɔ], not [nɔ̪]
dawn [dɔn], not [dɔn̪]

[ʃ], [ʒ]

The sounds [ʃ] and [ʒ] are made with the tongue farther front in the mouth than in Russian. Students will need to practice words like the following:

she [ʃi], not [ʃɨi]
leisure ['liʒɚ, 'liʒə], not ['liʒɨɚ, 'liʒɨə]

[dʒ], [tʃ]

The sound [dʒ] requires special notice here. Despite the fact that it is found in Russian, it is so infrequent there that Russians seem unfamiliar with it. Accordingly, as seen above, they substitute [tʃ], [ʒ] or [d] for it. A phrase like [dɔɪdʒ də sɪn] (daughter and son), where the [tʃ] of [dɔɪtʃ] (daughter) has been voiced by the

succeeding voiced consonant [d], may aid the student; or he may find success in voicing [tʃ] outright; or he may place together his well known [d] and [ʒ] to make [dʒ]; or he may know the loan-words [bu'dʒɛt] (budget) or [dʒut] (jute). The most common substitutions are [tʃ] and [ʒ]. The following will serve for practice:

John [dʒɑn,dʒɔn], not [tʃɑn,ʒɑn]
James [dʒeɪmz], not [tʃeɪmz, ʒeɪmz]
budge [bʌdʒ], not [bʌʃt]
judge [dʒʌdʒ], not [tʃʌtʃ]
bridge [brɪdʒ], not [brɪtʃ]

[ŋ]

The sound [ŋ] does not occur in Russian. The student readily understands diagrams and demonstrations showing that the back of the tongue is raised to touch the soft palate, the latter being dropped so as to leave the nasal passages open, and he makes the sound equally readily. But he experiences difficulty in stopping it without adding [g] or [k]. A good corrective device is to have the student pronounce sustained [m], [n] and [ŋ] in succession, thus: [m::::], [n::::], [ŋ::::]. The fact that he can pronounce [m] and [n] without plosives, since he is used to them, will help him with the [ŋ]. Pronouncing paired [ŋg, ŋ]-words will help 'split' [ŋg] and [ŋ] apart.

finger ['fɪŋgɚ, 'fɪŋgə]—singer ['sɪŋɚ, 'sɪŋə]
tingle ['tɪŋgəl]—bringing ['brɪŋɪŋ]
mingle ['mɪŋgəl]—clinging ['klɪŋɪŋ]
tangle ['tæŋgəl]—wronging ['rɔŋɪŋ]
jungle ['dʒʌŋgəl] flinging ['flɪŋɪŋ]
English ['ɪŋglɪʃ]—song [sɔŋ]
longest ['lɔŋgəst, 'lɔŋgɪst]—long [lɔŋ]

[r]

The sound [ɚ] has already been discussed. A shortened form of it serves passably for the consonantal [r] as in *roll* [roʊl]. The tongue points toward the middle of the roof of the mouth, as before. The trill must be suppressed—a difficult assignment for the Russian. Word list:

ring [rɪŋ], not [řɪŋ]
ride [raɪd], not [řaɪd]
wrote [roʊt], not [řoʊt]

[θ], [ð]

The sounds [θ] and [ð] do not occur in Russian. The prevalent substitutions are [s] and [z] or [t] and [d]. The best way to teach the two sounds seems to be to demonstrate them at first as interdentals, made with the tongue visibly protruding between the teeth. Later, as articulatory speed develops, the tongue will come no farther forward than the back surface of the upper teeth, which is the normal position with English-speaking people. Word list:

this [ðɪs], not [zɪs] nor [dɪs]
that [ðæt], not [zæt] nor [dæt]
those [ðoʊz], not [zoʊz] nor [doʊz]
thing [θɪŋ], not [sɪŋ] nor [tɪŋ]
three [θri], not [sri] nor [tri]
throw [θroʊ], not [sroʊ] nor [troʊ]

[h]

The sound [h] does not occur in Russian. The student will substitute [x]. He must be shown that [h] is not made in the back of the mouth, as is [x], but in the larynx. Demonstration of panting sounds seem to convey the idea of [h]. Much patient, repetitive practice is needed. Word list:

how [haʊ], not [xaʊ]
hide [haɪd], not [xaɪd]
hoe [hoʊ], not [xoʊ]
who [hu], not [xu]
have [hæv], not [xæv]

[w]

The sound [w] occurs in Russian, as a labial glide, as in ['kwɔɪʂ ɪ] (coffee), or as a variant of [uɪ], as in [pa'ʒɑɬwɪstə] (please). But the sound is not phonemic, and does not 'register' as [w] with the Russian speaker. Moreover, Russian newspapers and books transliterate English [w] as [v]. For instance, *Washington* is transliterated by symbols indicating the pronunciation ['vɑʃ▸ɪngtən]. Accordingly, the speaker tends to pronounce *w* as [v]. It is valuable to point out the [w]'s in Russian pronunciation, as above. But better still is to explain that [w] is based on [u]—that the 'leaping point' of the [w]-glide is [u]. *We* can therefore be transcribed and at first pronounced as [ui], *wall* as [uɔɬ], etc. Soon the speed of pronouncing the [u] can be quickened, so that [wi] and [wɔl] eventuate. List:

weal [wiɬ], not veal [viɬ]
wine [waɪn], not vine [vaɪn]
wide [waɪd], not vied [vaɪd]

[ʍ]

The sound [ʍ] does not occur in Russian. The best approach to it is to put together [h] and [u] for a beginning. *When* can then be transcribed and pronounced [huɛn], *while* as [huaɪl], etc. Soon [hu] can be quickened into [ʍ]. The Russian substitution is [v]. List:

why [ʍaɪ], not vie [vaɪ]
wheel [ʍil], not veal [vil]
what [ʍɑt, ʍɒt]
when [ʍɛn]
which [ʍɪtʃ]
whether [ʍɛðɚ, ʍɛðə]

Certain habits of the Russian tend to persist in the Russian's rendition of English:

1. The unvoicing of final [b, d, g, ʒ]. List:

tab [tæb], not tap [tæp]
bad [bæd], not bat [bæt]
tag [tæg], not tack [tæk]
rouge [ruʒ], not [ruʃ]

2. Voicing and unvoicing by regressive assimilation persists in English. List:

fish bait [fɪʃ beɪt], not [fɪʒ beɪt]
this boy [ðɪs bɔɪ], not [ðɪz bɔɪ]
back down [bæk daʊn] not [bæg daʊn]
rag tag [ræg tæg], not [ræk tæg]
write back [raɪt bæk], not [raɪd bæk]

3. The palatalization of consonants followed by [e], [ɛ], [i], [ɪ] persists in English. List:

fate [feɪt] not [ʄeɪt]
nest [nɛst], not [ɲɛst]
see [si], not [ɕi]
tin [tɪn], not [ʈin]

A passage of uncorrected Russian dialect:

xaf ju ʈeɳ ʄiŋgjeřs?

ɳɔ ai ɖu ɳɑʈ xaf ʈeɳ ʄiŋgjeřs, ai xaf et ʄingjeřs eɳʈ ʈu ʈams. vaɪ is id zat ɸipl ɔlves xaf kaʊɳʈəʈ sɔ imɸeřfɪkʄlɪ? ɔɳ itʃ▸ fuʈ aɪ xaf faɪf ʄiŋgjeřs—ʈen ɔlʈugjezer, bɑd zeř ař nɔ ʈams.

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The Relationship Between IQ and Indices of Infant Speech Sound Development

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and

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RECENTLY a considerable amount of research has been done on methods for studying infant speech sound development (*4, 7*). A great deal of data has been collected in order to describe the development of the infants' speech sound production, and tentative norms have been established for a number of indices of speech sound development (*2, 5, 9, 10*). In addition to this work, there has been an increasing interest in those variables which are related to infants' speech behavior (*1, 3, 6, 8*).

That there is a strong relationship, from about the second year of life through adulthood, between various measures of language development and the abilities measured by most tests of intelligence has long been a part of psychological knowledge. It is of considerable practical and theoretical importance to determine whether or not an analogous relationship exists between various indices of infant speech sound development and recognized tests of infant intelligence. If such relationship exists, furthermore, it is important to determine any influence age may have upon the relationship. The question of whether or not speech sound indices are needed as an additional means of evaluating infants' speech behavior may be answered by studying the strength of any obtained relationships. It is the purpose of this study to begin an exploratory investigation of these problems.

In this study, the writers make no attempt to evaluate either the reliability or validity of the particular intelligence scale used—the 1939 Kuhlmann Test of Mental Development (*12*). The writers take the position that a test measures those abilities which can be predicted from it, and it measures those abilities only as well as the accuracy of the predictions indicates.

The data obtained suggest that there are marked fluctuations in the IQ scores for some of the individuals. Whether this indicates poor reliability of the test or a real variation in the infant's abilities has not been determined. In any event, the strength of the relationship between two phenomena is underestimated, rather than overestimated, when unreliable measures of these phenomena are used, and consequently the correlation coefficients obtained in this study are quite conservative.

COLLECTION OF DATA

The method of collecting the speech sound data has been described by Irwin and Curry (*11*). In this study, an attempt was made to use two records each month for each child, from the time he was first included in the sample

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until he reached the age of 30 months. This ideal was not fully realized, however, because of the customary interferences which arise in longitudinal studies (*9*).

The intelligence scale given the infants was the 1939 Kuhlmann Test of Mental Development (*12*). The tests were administered by well-trained personnel of the State University of Iowa Child Welfare Clinic. The policy of the clinic was to administer the test several times before attempting to classify the infant, and for this reason, a number of the infants had several Kuhlmann scores available.

Selection of Subjects

From a total of 95 infants for whom speech records and/or Kuhlmann intelligence test scores were available, 48 infants were selected after having met each of the following three requirements:

(1) At least one Kuhlmann test score must have been available for the first 30 months of life.

(2) At least *two* speech sound records must have been collected *during* the two-months interval[1] in which the Kuhlmann test was given. In the event that more than two records were available for any interval, the two records nearest the date of testing were chosen.

(3) The infant must have had no

[1]The two month interval here referred to has elsewhere been called the 'bi-monthly age level,' or 'age level.' Accordingly, the term 'age level' is used in this report to refer to these periods. Age level 1 includes infants from one to two months of age; age level 2 includes infants from three to four months of age, etc.

Table 1. Description of the cases in the total group, Sub-group I, and Sub-group II in terms of sex and fathers' occupations.

Sex	Age Range (Levels)		Father's Occupational Categories: Profes-sional	Univ. Students	Small business	Clerical	Rural	Skilled	Unskilled	Totals
Male	1-6	N	10	4	7	3	2	2	0	28
		%	35.7	14.3	25.0	10.7	7.1	7.1	0	100.0
	7-14	N	17	2	2	3	1	8	0	33
		%	51.5	6.1	6.1	9.1	3.0	24.2	0	100.0
	1-14	N	27	6	9	6	3	10	0	61
		%	44.3	9.8	14.8	9.8	4.9	16.4	0	100.0
Female	1-6	N	10	2	4	5	0	7	0	28
		%	35.7	7.1	14.3	17.9	0	25.0	0	100.0
	7-14	N	9	1	4	2	0	8	4	28
		%	32.1	3.6	14.3	7.1	0	28.6	14.3	100.0
	1-14	N	19	3	8	7	0	15	4	56
		%	33.9	5.4	14.3	12.5	0	26.8	7.1	100.0
Totals (both sexes)	1-6	N	20	6	11	8	2	9	0	56
		%	35.7	10.7	19.6	14.3	3.6	16.1	0	100.0
	7-14	N	26	3	6	5	1	16	4	61
		%	42.6	4.9	9.8	8.2	1.6	26.2	6.6	99.9
	1-14	N	46	9	17	13	3	25	4	117
		%	39.3	7.7	14.5	11.1	2.6	21.4	3.4	100.0

TABLE 2. Description of the individuals in the total group, Sub-group I, and Sub-group II in terms of sex and fathers' occupations.

			Father's Occupational Categories							
Sex	*Age Range (Levels)*		*Profes-sional*	*Univ. Students*	*Small business*	*Clerical*	*Rural*	*Skilled*	*Unskilled*	*Totals*
Male	1-14	N	11	2	3	5	1	4	0	26
		%	22.9	4.2	6.2	10.4	2.1	8.3	0	54.1
Female	1-14	N	8	2	2	3	0	6	1	22
		%	16.7	4.2	4.2	6.2	0	12.5	2.1	45.9
Totals (Male & Female)	1-14	N	19	4	5	8	1	10	1	48
		%	39.6	8.3	10.4	16.7	2.1	20.8	2.1	100.0
Male	1-6	N	5	2	3	2	1	2	0	15
		%	15.2	6.1	9.1	6.1	3.0	6.1	0	45.6
Female	1-6	N	7	2	2	3	0	4	0	18
		%	21.2	6.1	6.1	9.1	0	12.1	0	54.6
Totals	1-6	N	12	4	5	5	1	6	0	33
		%	36.4	12.1	15.2	15.2	3.0	18.2	0	100.1
Male	7-14	N	10	1	2	2	1	4	0	20
		%	29.4	2.9	5.9	5.9	2.9	11.8	0	58.8
Female	7-14	N	5	1	1	1	0	5	1	14
		%	14.8	2.9	2.9	2.9	0	14.8	2.9	41.2
Totals	7-14	N	15	2	3	3	1	9	1	34
		%	44.1	5.9	8.8	8.8	2.9	26.5	2.9	99.9

discernible physical defects of a serious nature, and he must have been born at or near full term.

Many of the infants met the above requirements at more than one age level, and they were included in the sample more than once. Thus, the 48 individual infants contributed a total of 117 'cases,' averaging 2.4 cases per individual. All statistical analyses included in the report are based on these cases rather than directly on the individual infants.

In order to investigate the possible influence of age on the relationship between IQ and speech sound status, the total sample of 48 individuals and 117 cases was divided into two sub-groups. Sub-group I, with 33 different individuals and 56 cases, consisted of those cases in the age range 1 to 12 months inclusive (age levels 1 to 6 inclusive). Sub-group II, with 34 different individuals and 61 cases, consisted of those cases in the age range 13 to 28 months inclusive (age levels 7 to 14 inclusive). Analyses of the data were made on the basis of the total group, sub-group I, and sub-group II.

Description of Sample

The sample used in this study may not be considered representative of the general population of infants. An attempt has been made to construct the hypothetical population of which the group is a sample, with respect to the variables of age, sex, and father's occupation. Table 1 presents summaries of the frequencies and percentages of cases falling within the different age,

sex, and occupational categories. From this table, it may be determined, for example, that of the 117 cases in the total sample, 61 are males and 56 are females. These figures indicate that the total sample is about equally distributed between the sexes. Similarly, the cases are approximately equally distributed between the sexes for sub-group I and sub-group II. Table 2 shows the distribution of the individuals from whom the cases are drawn.

An examination of Table 1 indicates that the group as a whole represents an extreme upward selection from the general population, if father's occupation be regarded as an index of general socio-economic status.[2] This is also true of the two sub-groups.

These restrictions on the general representativeness of the sample must be considered in the interpretation of the results of the statistical analyses. It should be noted, however, that the infants in this study were free from physical anomalies, and that the statistical analyses will not be confounded by the extreme relationships which would result from such conditions.

Selection of Indices of Speech Development

Several indices have been previously described in the literature and have been suggested as measures of various aspects of infant speech sound development. Six of these indices lend themselves to the purpose of this study. Regression equations on age have been computed for each for a sample of 95 infants, ranging from one through 30 months of age. Brief verbal descriptions of these indices together with their regression equations are given below.

Phoneme type is the mean number per 30 breath-unit record of different phoneme types produced by an infant during an age level. The regression on age is described by the equation: $PT=7.533A^{0.471}$, where PT is the mean number of phoneme types and A is the age level (*9*).

Phoneme frequency is the mean number per record of sounds, irrespective of type, produced by an infant during an age level. The regression on age is given by the equations: $PF=4.493A-58.5$ (for age levels 1 to 9) and $PF=27e^{0.1774A}$ (for age levels 9 to 15), where PF is the phoneme frequency, A is the age level, and $e=2.718$ (*5*).

Vowel type is the mean number per record of different vowel types produced by an infant during an age level. The regression on age is given by the equation: $VT=5.42A^{0.274}$, where VT is the vowel type and A is the age level (*2*).

Vowel frequency is the mean number per record of vowel sounds produced by an infant during a given age level. The regression on age is given by the equations: $VF=.69A-51.8$ (for age levels 1 to 11) and $VF=4.63A-53.5$ (for age levels 11 to 15[3], where VF is the vowel frequency and A is the age level (*10*).

Consonant type is the mean number per record of different consonant types produced by an infant during an age level. The regression on age is given by: $CT=2.911A^{0.622}$, where CT is the consonant type and A is the age level (*2*).

Consonant frequency is the mean number per record of consonantal

[2]The categories used in Table 1 are generally self-explanatory. The 'professional' category includes college professors, physicians, lawyers, engineers, etc. The 'university student' category also includes teachers below the college level. The 'small business' category consists of the proprietors of small businesses. 'Clerical' includes salesmen, office managers, typists, etc. The father of the single individual in the 'rural' category was a tenant farmer. The 'skilled' and 'unskilled' categories were defined according to the conventional usages.

[3]The equation for the VF (age levels 9 to 15) given here is not that reported by Irwin and Chen (10). This equation was recalculated and a somewhat better fit obtained.

sounds produced by an infant during an age level. The regression on age is given by the equation: $CF=12.5e^{0.124A}$, where CF is the consonant frequency, A is the age level, and e=2.718 (*10*).

In the present state of knowledge in this area, there is no way to rank these indices with respect to their importance for measuring general speech sound developmental status; that is, they are theoretical equivalents.

Adjustment of Basic Indices

In this form, the basic indices cannot be used for correlational purposes. Partial correlation, holding age constant, involves the assumption of linear relationships. An examination of the regression equations given above indicates that few of the relationships are linear. The indices may be adjusted in terms of the regression equations, however, thus eliminating that part of the score which can be ascribed to regression on age.[4] A specific illustration will clarify this procedure. The regression equation for consonant type on age is: $CT=2.911A^{0.622}$. In order to eliminate the influence of age on the CT score, it is necessary only to divide the score by the term, $A^{0.622}$. For convenience, the adjusted consonant type score will be designated 'consonant type quotient,' and where no confusion will result, it will be abbreviated 'CTQ.'

In order to eliminate decimals in the statistical computations, the adjusted indices were multiplied by 10, and all decimal places dropped. Since there is a considerable range of scores, this procedure in no way alters the rank order of the scores.

Regression equations for these basic indices on age were not computed separately for the group included in this study for the following reasons:

(1) The relatively small number of cases at each age level in the present study would not yield the reliable means necessary for computing regression equations.

(2) The means of the indices obtained for the present group were plotted together with those for the larger group in the previous studies, and the differences appeared to be negligible.

(3) The concern of the present study is with relationships and not with the establishing of norms.

Combined Adjusted Index

In view of the complexity of the speech sound developmental process, it is desirable to combine a number of separate indices in order to represent this complex phenomenon more completely. The choice of these indices should be governed by the condition of low or moderate inter-correlation.

The inter-correlations for the six adjusted indices were computed and are given in Table 3. Two facts emerge from a study of this table. Type and frequency are seen to be relatively independent. None of the three correlations exceeds .50. Consonantal and vowel status appear as two relatively separate aspects of the speech sound

Table 3. Inter-correlations of the adjusted indices with levels of significance* for the total group (age range: 1-28 months. 117 cases).

Indices	*PFQ*	*CFQ*	*VFQ*	*PTQ*	*CTQ*
CFQ	.452 1%				
VFQ	.530 1%	.390 1%			
PTQ	.268 1%	.270 1%	.298 1%		
CTQ	.180 7%	.497 1%	.101 25%	.795 1%	
VTQ	.239 1%	.103 25%	.426 1%	.700 1%	.325 1%

*The value of *t* was computed from the following formula:

$$t=\frac{r}{\sqrt{1-r^2}}\cdot\sqrt{N-2},$$

and probabilities read from tables for *t*.

[4] A discussion of the theoretical basis of this procedure is given by Snedecor (13), pp. 114 ff.

developmental process. The highest correlation here is .39.

As a result of the above analysis of the inter-correlations, it was decided that the four adjusted indices, consonant type quotient, vowel type quotient, vowel frequency quotient, and the consonant frequency quotient, should be the most appropriate indices to combine into a single index. The inter-correlations among these four indices are not high enough to justify the substitution of one for another, nor are they so high as to introduce excessive repetition of the elements accounting for the relationships. Since these four indices, in the light of present knowledge, are theoretical equivalents, equal weight was given each in the combined index.

The scores for each of these four adjusted indices were transformed into standard scores, and were added together for each individual case to produce a single score.[5] Each score was multiplied by a constant (10) and was rounded to an integer, positive and negative values were retained, and a mean score of zero was thus obtained.

Results of Analysis of Data for Total Group

The following tabulation shows the distribution of the 117 cases for each of the 14 age levels:

Age Level	*No. Cases*
1	1
2	12
3	11
4	12
5	15
6	5
7	9
8	16
9	12
10	5
11	10
12	8
13	0
14	1

[5]Chi-square tests of the normality of the frequency distributions indicate that all indices are relatively normally distributed for the cases included in this study. For no index was chi-square significant at the 5% level of confidence.

The above tabulation also may be used to determine the distribution of the cases at each age level for sub-groups I and II.

Except for age levels 1, 13, and 14, each age level would appear to be adequately represented for the purpose of a study of the present type. In view of the single case above the 12th age level, it is advisable to limit any generalizations from the results to the age range from 1 to 24 months.

The mean IQ for the total group is 103.2 with a standard deviation of 18.5.

Table 4 presents a summary of the correlations between IQ and each of the seven adjusted indices, together with the means and standard deviations for each of the indices. In the last column of the table is given the level of confidence with which it can be stated that the true correlation coefficient differs from zero. An examination of this table shows that the correlation coefficients obtained for the VTQ, PTQ, and VFQ are significant at the 1% level of confidence. The correlation coefficients for the CFQ, PFQ, and the

Table 4. Summary of the means and standard deviations for each of the adjusted indices for the total group, together with the levels of significance of their correlations with IQ.

Index	*Mean*	*Standard Deviation*	*Pearson r*	*Level of Significance*[6]
CTQ	27.7	9.1	.162	8%
VTQ	54.3	10.6	.435	1%
PTQ	75.2	15.9	.265	1%
CFQ	12.6	4.8	.107	25%
VFQ	53.8	12.3	.244	1%
PFQ	59.3	30.8	.076	41%
Combined	0.0	27.9	.028	75%

[6]The value of t was computed from the following formula:

$$t = \frac{r}{\sqrt{1-r^2}} \cdot \sqrt{N-2},$$

and probabilities read from tables for t. df=115 .

TABLE 5. Summary of the means and standard deviations for each of the adjusted indices for Sub-group I, together with the levels of significance of their correlations with IQ.

Index	*Mean*	*Standard Deviation*	*Pearson r*	*Level of Significance**
CTQ	25.9	10.1	.207	12%
VTQ	54.0	13.6	.511	1%
PTQ	74.5	17.6	.250	5%
CFQ	12.7	5.9	.046	74%
VFQ	54.8	13.9	.295	5%
PFQ	61.7	18.0	.088	52%

*The value of t was computed from the following formula:

$$t = \frac{r}{\sqrt{1-r^2}} \cdot \sqrt{N-2},$$

and probabilities read from tables for t. df = 54.

combined index are not significant at either the 1% or 5% levels. Despite the fact that two of the four adjusted indices included in the combined index are significantly related to IQ at the 1% level, the combined index itself does not appear to be at all related to the IQ scores.

RESULTS OF ANALYSIS OF DATA FOR SUB-GROUP I

The mean IQ for sub-group I is 103.5 with a standard deviation of 24.8. A comparison of Table 5 with Tables 4 and 6 indicates that the heterogeneity in IQ for sub-group I is also accompanied by heterogeneity for each of the adjusted indices of speech sound development, with the single exception of that for the PFQ.

Table 5 presents a summary of the correlation coefficients between IQ and the six adjusted indices. No combined index was computed for this group, since the correlation coefficients between the separate indices and IQ were generally low. An examination of Table 5 indicates that only the VTQ is significant at the 1% level. The correlation coefficient for this index is the highest for the six indices in this group (.51), just as it was for the seven indices in the total group (.43). The PTQ and the VFQ are significantly correlated with IQ at the 5% level. None of the other correlation coefficients is significant at the 5% level.

RESULTS OF ANALYSIS OF DATA FOR SUB-GROUP II

The mean IQ for sub-group II is 102.9 with a standard deviation of 9.6. This sub-group appears to be much more homogeneous with respect to IQ and the adjusted indices than does sub-group I. Despite this smaller range of variability, the indices for this group show generally higher correlations with IQ than do those obtained for sub-group I.

Table 6 gives a summary of the correlation coefficients for the seven adjusted indices for sub-group II. The PTQ, CFQ, and VFQ are significantly correlated with IQ at the 1% level of confidence. The combined index has a correlation coefficient significant at the 2% level. This level of significance contrasts sharply with that obtained

TABLE 6. Summary of the means and standard deviations for each of the adjusted indices for Sub-group II, together with the levels of significance of their correlations with IQ.

Index	*Mean*	*Standard Deviation*	*Pearson r*	*Level of Significance**
CTQ	29.3	7.6	.075	56%
VTQ	54.7	7.6	.140	27%
PTQ	75.9	14.1	.366	1%
CFQ	12.5	3.5	.351	1%
VFQ	52.9	10.5	.397	1%
PFQ	57.0	38.8	.121	36%
Combined	0.0	31.6	.313	2%

*The value of t was computed from the following formula:

$$t = \frac{r}{\sqrt{1-r^2}} \cdot \sqrt{N-2},$$

and probabilities read from tables for t. df = 59.

for the total group, and by inference we may conclude that the correlation coefficient for sub-group I would approach zero. The correlation coefficients for the other indices with IQ are not significant at the 5% level.

Summary of Results of Analysis of Data

Table 7 presents a summary of the correlation coefficients and their levels of significance which were obtained for the three groups. Summarizing from this table, we find that the PTQ and VFQ were significantly correlated with IQ at or beyond the 5% level for all three groups. The CTQ and the PFQ are not signficantly correlated with IQ at the 5% level for any of the three groups. The other three indices do not show consistent correlations within the three groups. It should be noted that none of the 20 correlation coefficients is negative. Further, of these 20, 10 are significant at or beyond the 5% level of confidence. Although such a distribution cannot be reasonably attributed to chance, no basis for prediction is afforded by these *r's*.

Conclusions

The results of this study are not as conclusive as might be desired. Some information is provided, however, for each of the three main problems discussed in the introduction.

1. There appears to be a small but reliable relationship between certain aspects of infant speech sound development and the abilities measured by the Kuhlmann Test of Mental Development. It is not advisable to generalize from this evidence that the entire process of speech sound development is related to these abilities, although the results of this study do not preclude this possibility.

2. There is some inconclusive evidence that the strength of the relationship between certain of the adjusted indices and IQ increases with an increase in age. The vowel type index was the only adjusted index which was significantly related to IQ for sub-group I and not for sub-group II. Since it is known that vowel type development is nearly complete by the end of the first year, it is quite possible that the VTQ is not a discriminating index for the older group. For all other indices, the correlation coefficients were significant at a higher level of confidence for sub-group II than for sub-group I. This particular problem, however, is in need of further special investigation, one in which the consistency of the intelligence scale is held constant or is otherwise controlled at each of the various age levels studied.

3. The sizes of the correlation coefficients obtained in this study are not

Table 7. Summary of the correlations and their levels of significance between IQ and seven adjusted indices of speech sound development for the total group and for the two sub-groups. (Compiled from Tables 3, 4 and 5.)

	Total Group N = 117		*Sub-group I N = 56*		*Sub-group II N = 61*	
Index	*Pearson r*	*Level Signif.*	*Pearson r*	*Level Signif.*	*Pearson r*	*Level Signif.*
CTQ	.162	8%	.207	12%	.075	56%
VTQ	.435	1%	.511	1%	.140	27%
PTQ	.265	1%	.250	5%	.366	1%
CFQ	.107	25%	.046	74%	.351	1%
VFQ	.244	1%	.295	5%	.397	1%
PFQ	.076	41%	.088	52%	.121	36%
Combined	.028	75%			.313	2%

large enough to provide accurate basis for the prediction of IQ from speech sound indices, and *vice versa*. The largest correlation coefficient obtained —that for the VTQ for sub-group II —is only .511. Its coefficient of determination is .261, which indicates that only about 26% of the variance in IQ can be accounted for by the VTQ.

Summary

This study was designed as an exploratory study of the relationships postulated to exist between certain aspects of infant speech sound development and the IQ's obtained from a recognized test of infant intelligence. Forty-eight infants, aged 1 to 28 months, contributing 117 cases, constituted the total sample. This sample was divided on the basis of age into two sub-groups for the purpose of investigating the influence of age on the relationships. The subjects represented an upward selection of the socio-economic groups.

The method of collecting the speech sound data consisted of the recording by a trained observer of the sounds produced by an infant on a single breath. The basic indices were adjusted to eliminate age influence by use of their regression equations on age.

The investigators conclude that there is a small but reliable relationship between certain aspects of infant speech sound development and the ability or abilities measured by the Kuhlmann Test of Mental Development. Further, they have found some evidence that the strength of this relationship increases with an increase in age. And finally, the sizes of the correlation coefficients obtained in the study do not permit useful prediction of one variate from another.

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The Neurological Evaluation of Delayed Speech

William G. Peacher

THE historical aspects in relation to the various etiological factors responsible for the presence of delayed speech have been previously recorded (*46*). Two new terms were suggested when a neurological basis could be demonstrated, *cumlingualism* signifying impairment of speech and *sinlingualism* implying failure of the language process to develop.

It is the purpose of the present article to outline the various methods of examination that are available from a neurological standpoint in the investigation of problems pertaining to delay in the development of the langauge mechanism. The importance of the psychologist, audiologist, speech pathologist, and related medical specialties cannot be over-emphasized for their part in the adequate survey of these problems. A complete analysis of each phase of this subject, however, is beyond the scope of this presentation.

It has been only in recent years that there has been any attempt to organize the various methods of examination in delayed speech. The earlier reports most commonly depended upon the question-answer type of survey following impressionistic observations, due to marked language and motor delay, the extent of the analysis depending upon the field of the investigator (*65, 66, 68*). On the whole, physical, mental, speech, and audiometric exploration have been stressed in the current literature (*37, 44, 58*).

As cases of sinlingualism not uncommonly represent but one aspect of the delayed developmental process, it is necessary, obviously, to carry out detailed evaluation of all phases of existing cerebral function, as will be indicated in the following schema. In the presence of cumlingualism, the close similarity to the dysphasias is reflected in the application of the tests described by Head (*29*) to problems of this type. Worster-Drought and Allen (*70, 71*), Creak (*10*), Rogerson (*51*), and others have already reported their observations along these lines with patients diagnosed as congenital auditory imperception. The latter designation actually falls into the present classification depending upon the level of speech development, site of major dysfunction, etc., e.g., cumlingualism, temporal, left, if the pathology is localized to this lobe after adequate investigation. It is also interesting to note that all authors are not in accord with the application of the dysphasia tests to cases of this type (*20*).

Case History

An accurate investigation of the present and past history of both the individual and his or her family is essential for any available clues that may aid the establishment of an adequate diagnosis. Particular emphasis is made on the para-natal events, congenital abnormalities, history of communicable disease, trauma, etc., and on the various phases of development.

The following conditions arising during the para-natal period are most

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commonly associated with developmental delay on a neurological basis:

1. Pre-natal: trauma, x-ray therapy, communicable diseases particularly measles and rubella, cardio-vascular disease, avitaminosis, etc.

2. Natal: prematurity, prolonged delivery, abnormal presentations, trauma (manipulation, forceps, etc.) anesthetic, etc.

3. Post-natal: trauma, encephalitis, meningitis, otitis media, Rh factor, communicable diseases such as pertussis, scarlet fever, measles, etc., avitaminosis, malnutrition, anemia, rickets, etc.

Medical Evaluation

It is not intended to list all of the cardinal features in the physical, neurological, or psychiatric examinations at this time as these are adequately covered in the respective papers and monographs elsewhere. It is our purpose, rather, to direct attention to their general importance and to emphasize certain specific factors.

Physical Examination. In addition to the various neurological syndromes (congenital, neoplastic, inflammatory, traumatic, heredodegenerative, etc.), various physical disorders may also result in developmental delay such as rickets, malnutrition, avitaminosis, chronic infections such as tuberculosis, bronchitis, etc.; disorders of metabolism, e.g., cretinism, cerebral complications of acute glomerular nephritis; vascular lesions, including hemorrhagic disease of the newborn, hemophilia, anemia, thrombocytopenic purpura, etc. Particular emphasis should be placed on the possible presence of associated anomalies of the peripheral speech apparatus which may further accentuate developmental delay, such as cleft lip and palate, aglossia, laryngeal, and pharyngeal deformities.

Neurological Examination. A knowledge of the normal development of language is absolutely essential in the differentiation of abnormalities in this process. This problem will not be discussed in detail here as it has been developed and reviewed in many independent papers as well as texts of speech and child psychology. The controversy over the use of the term, congenital aphasia, has already been described (*46*). By a similar token, motor, social, and mental development together with the establishment of handedness are also important. The concepts of apraxia, agnosia, and ambilaterality fall into this category. Other developmental language processes should also be included in investigations of this type, such as reading, writing, spelling, calculation disorders, etc., as they are not uncommonly implicated in the patient with delayed speech on a neurological basis.

The following neuropathological processes have been commonly associated with delayed development; and should be carefully considered and ruled out during the examination:

1. Traumatic lesions, such as cerebral contusion and laceration, petechial hemorrhages, subdural and extradural hematomata with associated brain damage, etc.

2. Infectious processes including meningitis, encephalitis (bacterial and virus), brain abscess, juvenile paresis, etc.

3. Neoplasms: medulloblastoma, astrocytoma, craniopharyngioma, angioma, etc.

4. Degenerative diseases: Schilder's disease, amaurotic familial idiocy, tuberose sclerosis, Heller's disease, etc.

5. Nutritional: vitamine deficiency such as pellagra.

6. Endocrine: cretinism, mongolism, hypopituitarism, Laurence-Moon - Biedl syndrome, gargoylism, etc.

7. Aplasia: agenesis of the corpus callosum, craniostenosis, etc.

8. Toxic: lead encephalopathy

9. Vascular: arterial and venous anomalies

10. Malformations: hydrocephalus, macrocephalus.

In addition to the usual neurological tests for motor behavior, the objective methods described by Oseretsky and Heath (*15, 30, 31*) should also be made available in suitable instances.

Cranial nerve investigation is essential, particularly those implicating the

speech mechanism which may further accentuate the primary process producing delay. These include the trigeminal, facial, auditory, glossopharyngeal, vagus, accessory and hypoglossal nerves. Defective vision and ocular imbalance should be carefully ruled out. Investigation of eighth nerve function is paramount in all problems of this type and includes testing of both cochlear and vestibular divisions.

The differential diagnosis of the various disorders of equilibrium and coordination is important, such as found in the delayed motor development of the mentally deficient, cerebellar, or pyramidal tract dysfunction, developmental apraxia, etc. Adequate tests of eighth nerve function in the early age groups would help rule out etiology from this standpoint. Investigation of the galvanic skin resistance response (*5*) as an objective diagnostic test of the threshold of auditory acuity is planned. In addition, the caloric test as modified by Fitzgerald and Hallpike (*21*), Cawthorne, Fitzgerald, and Hallpike (*7*) and others are now being evaluated in relation to vestibular dysfunction and its possible localization. The researches of Shuster (*56*), and Coates, Shuster, and Slotkin (*9*) are also important from this aspect. Caloric tests are important because of unilateral stimulation of either the horizontal or vertical canals which may permit differentiation between a central and peripheral lesion of the nervous system. The use of the Barany chair, however, is less qualitative due to bilateral stimulation of either of the canals. The apparatus is expensive, further, and children are not always cooperative. Positional stimuli allow study of the head righting reflexes which are altered in vestibular dysfunction. Table tests, such as described by Rademaker and Garcin (*50*) have allowed differentiation of labyrinthine and cerebellar lesions in selected instances. Monaural and biaural galvanic stimulation of the vestibular apparatus is less well standardized, and the origin of the response not completely determined.

It is also important to be familiar with the various normal developmental phases of the nervous system, particularly in relation to the persistence of certain reflexes beyond the usual period for their disappearance. These include the sucking, grasping, Babinski, and the Moro reflexes as well as the various reflexes of posture and equilibrium. There are several groups of postural reflexes: labyrinthine reflexes acting upon the head; optic righting reflexes; righting reflexes arising in the deep structures of the body and influencing the head, trunk, and extremities; and righting reflexes originating in the deep cervical tissues producing an effect upon the trunk and limbs. These reactions gradually disappear during normal maturational processes but may be present as a result of various pathological processes. The normal motor patterns found in an adult are not usually achieved until the age of 15.

The significant point to be gained from an evaluation of postural reflexes is that they may give important diagnostic clues as to localization even in the presence of an otherwise negative neurological examination. Teicher (*61*) found in a study of the motility patterns of 200 children that there was a definite relationship between laterality and dominance of reflexes, e.g., reading disabilities were often found with a disturbance of these postural mechanisms. It is to be pointed out that the Babinski sign normally ceases at the age of two but may persist as late as 10 years in mentally retarded children (59). Strauss and Lehtinen (*59*) further state that a neurological diagnosis is possible only on the basis of a major lesion such as hemiplegia, flaccidity, etc. before the age of two. Minor findings up to the age of five may indicate delayed motor development rather than major pathology, but such data after the age of 10 are of consequence. These authors rely large-

ly on examination of the pupils, presence of nystagmus, ocular, facial, and hypoglossal palsies, abnormal movements, superficial and deep tendon reflexes, gait, and pathlogical signs. Their complete diagnostic criteria of brain injury, therefore, include the neurological examination, positive etiology, psychometric retardation or impairment on the perceptual and conceptual tests.

Neuropsychiatric Examination. Neuropsychiatric evaluation is essential in the adequate evaluation of the individual. Kanner (*35*) stresses the following etiological factors: physical, intellectual, emotional, situational, and constitutional.

Psychological implications are also of significance—particularly the mental level, ontogenetic, and phylogenetic factors. Reliance is generally placed upon performance and projective tests, depending upon the age group, in addition to the Social Maturity scale. The parental, sibling, school, social, and local environmental situations are essential from the standpoint of investigation. To establish rapport with the child during the initial interviews, a play diagnosis situation is of great value and will also give added insight into associated behavioral and other psychological factors which may also need therapy.

Other conditions which may be reflected in the development of the child and should be considered during routine neuropsychiatric examination include:

1. Mental deficiencies: endogenous and exogenous.
2. Psychoneuroses: anxiety, hysteria, hypochondriasis, etc.
3. Psychoses: schizophrenia, dementia praecocissima.
4. Convulsive disorders: epilepsy.
5. Early infantile autism.
6. Psychopathic personality.
7. Behavioral deviations: pathological manifestations such as distractability, forced responsiveness to stimuli, perseveration, dissociation, organic driveness (*34*), catastrophic reaction (*26*), etc., are typical of the brain injured child. Conceptual tests are available on a more objective level to allow a more accurate evaluation of these symptoms.

Perceptual tests in the visual, auditory, and tactile spheres also revealed interesting results in the brain injured child, e.g., discontinuity and incoherence on the marble board test; strong interference to the diffuse background on the tactuo-motor test; and an irregular performance on the auditory perception test (*59*).

Bijou and Werner (*2*) studied the vocabulary in brain injured children, selecting a group of names from Thorndike's word list of 20,000 most frequently used words. The following characteristics were typical of the exogenous group:

Superiority of language

Words were defined as to their definite properties rather than use as in the endogenous. The latter has been described as immature according to Terman and Merrill (*62*).

Multiple rather than single aspects of a definition was typical of the organic group.

This work was further extended by these authors (*3*) in a later study with corroboration of the earlier findings.

Werner and Carrison (*67*) also differentiated the brain injured child on the basis of animistic thinking, e.g., they considered objects of the inanimate class and natural events as living; differentiated objects on the basis of use and human characteristics rather than spontaneous movements as in the endogenous group. The responses were also more variable and unique and they more often believed in the conscious activity of the objects and events.

Strauss' work on conceptual and perceptual behavior is summarized in his monograph with Lehtinen (*59*). Halstead's (*28*) research on this subject is interesting on the conceptual level particularly in that the tests were performed on patients with neurologically verified lesions.

Although relatively uncommon, early infantile autism, childhood schizophrenia, post-encephalitic, and post-traumatic behavior disorders should be carefully differentiated due to the varying types of therapy indicated and prognostic factors.

Laboratory Studies

Although some investigators have felt that X-rays of the skull are of little value in diagnosis (*11*), they occasionally reveal very helpful and worthwhile information (*53*), such as presence or absence of increased intracranial pressure, cerebral hemi-atrophy with increase in the size of the skull and sinuses (*16*), evidence of previous fracture (*8*), premature closure of the suture lines in cases of microcephaly which must be differentiated from the craniostenoses (*57*), changes in vascularity, possible calcification such as tuberous sclerosis (*73*), toxoplasmosis (*17*), epilepsy (*22*), etc.

A lumbar puncture alone will probably be of little value other than in the presence of possible increased intracranial pressure, inflammatory process, etc., for determination of pressure and chemical analysis. This view has also been expressed by Crothers, Vogt, and Eley (*11*).

X-rays of the long bones may also reveal useful data in relation to delay in the appearance of the various ossification centers and changes in the epiphyseal lines. Such deviations may represent early cretinism or mongolism in conjunction with other pertinent clinical data.

Hematological and biochemical studies may also give confirmatory data in such conditions as cretinism, mongolism, etc. Such investigations include estimation of calcium, phosphorus, blood plasma volume, glucose and insulin tolerance tests, sodium, total protein, cholesterol, basal metabolic rate, etc.

The application of objective cranial mensuration is not commonly recognized. Anthropometry is far more accurate than the usual fronto-occipital and bi-parietal measurements and subjective impressions of the skull size. This method will allow greater analysis of the common cranial abnormalities such as turricephaly, scaphocephaly, plagiocephaly, etc.

Electro-encephalography

The use of the electro-encephalogram as an aid in neurological diagnosis is already well established (*14, 23, 24, 41, 47, 49, 60, 69*). It has achieved its greatest usefulness in the diagnosis of the epilepsies and related convulsive states.

The electro-encephalogram, however, may not always be a sensitive indicator of brain damage in the early age groups, as demonstrated by Gibbs and Gibbs (*23*), and Strauss and Lehtinen (*59*). Abnormal tracings are not uncommon, in fact, under normal circumstances below the age of 10 (*23*). Perlstein (*48*) further states that the younger the patient, the greater the frequency of dysrhythmia. In addition, children with behavior disorders without brain injury may reveal changes which are difficult to differentiate from a diagnostic standpoint (*33*). The factor of economics must also be considered and weighed against the possible information obtained. Adequate cooperation is essential for a satisfactory tracing, which is not often possible due to the hyperactivity, short attention span, etc., of many of these patients. Sedation has been used in some instances, although this method may alter the result from interference of the wave pattern with the drug. On the other hand, Peterman (*49*) and Gibbs (*25*) feel that this procedure has been of some value in cases of abnormal behavior and the epilepsies.

That the electro-encephalogram is of value in some cases of cerebral agensis was pointed out in a recent paper by Beswick (*1*). It is also important to mention a study by Sarason

and Sarason (*52*) in cerebral palsied patients. They found a higher degree of correlation of electrogram changes with psychometric evidence of brain damage than when the latter was absent. A similar study by Greenblatt, Levin, and Atwell (*27*) was carried out in adults. The diagnostic value of the psychological analysis was found to be greater than the electro-encephalogram, although their combined usefulness was felt to be superior than either method alone.

Angiography

This procedure was first suggested by Moniz (*42, 43*) and consists in the introduction of a radio-opaque substance (thorotrast or diodrast) into the common carotid artery so that visualization of the ipsilateral cerebral vessels can be accomplished. The internal carotid, anterior, and middle cerebral vessels are usually well identified, but the posterior cerebral artery is filled in only approximately 15 per cent of the cases. The posterior fossal structures are best identified with injection of the vertebral artery, technic for which has been described by List, Burge, and Hodges (*39*). Ingraham and Cobb (*32*) have recently described the value of this procedure in the younger age groups in selected instances and have carefully outlined the technic.

Angiography has achieved its greatest application in the investigation of vascular disorders, not only in relation to localization of pathology but also in the demonstration of the anatomical character of the lesion. It has been found useful in the detection of aneurysms, vascular occlusions and coarctations, arterio-venous fistulae, vascular tumors such as meningiomas, angiomas, glioblastomas, etc., congenital arterio-venous malformations, etc. This procedure may also be used to supplement the clinical data when the neurological, physical, and psychological findings, electro-encephalogram, and pneumo-encephalogram are inconclusive.

The possible diagnostic value of this procedure in cases of developmental delay in the presence of an atrophic lesion diagnosed on the basis of history, neurological examination, and electro-encephalogram was intimated by List and Hodges (*40*). They described a seven-year-old girl who gave a history of spontaneous delivery from an eclamptic mother followed by postnatal cyanosis and left spastic hemiplegia. The encephalogram showed an atrophic lesion of the right cerebral hemisphere. A probable diagnosis of thrombosis of the middle cerebral artery was made on angiography due to practically no filling of this vessel on routine films.

Encephalography and Ventriculography

The intentional withdrawal of spinal fluid and injection of air in the lumbar subarachnoid spaces was first described by Dandy (*13*) in 1919 with the purpose of demonstrating the cerebral ventricles and subarachnoid spaces. This procedure was called encephalography by Bingel (*4*) in 1921.

Some clinics prefer the injection of air in the cisterna magna, known as sub-occipital or cisternal encephalography, particularly in view of fewer immediate reactions. Considerable experience is necessary for this procedure, however, and there is always the danger of medullary puncture, which would limit its usefulness in this age group.

Ventriculography, on the other hand, consists in the direct injection of air into the ventricles, either through the trephined skull or patent anterior fontanel. Coincidentally, it, too, was first described by Dandy (*12*).

Lumbar encephalography is not only technically less difficult than ventriculography, but also has the advantage of demonstrating the cerebral subarachnoid spaces and cisterns. Alterations of these structures in cases of epilepsy, atrophic, and degenerative lesions, post-meningitic pathology, etc.,

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would, therefore, only be demonstrated by this route. Ventriculography is reserved for patients with increased intracranial pressure, marked hydrocephalus, failure of encephalography, posterior fossal tumors, etc.

The great importance of encephalography as an aid in establishing a diagnosis has been demonstrated by Brody and McAlenney (*6*), Levinson (*38*), Schneider (*55*), Palmgren (*45*), and others. Remediable lesions may be disclosed, such as meningo-cerebral cicatrices, porencephaly, subdural hematoma, meningeal scars, etc. A single study, however, should not be relied upon alone from a prognostic standpoint, but as an added crutch in conjunction with the entire assembled clinical data, including the history, physical, and neurological examinations, psychometrics, electro-encephalogram, etc. The same may be said concerning the mental status. That brain growth may occur on repeated encephalograms has been demonstrated by Wyatt and Carey (*72*), although the reverse may be true or the pathology remain fixed as shown by Evans (*18, 19*), King (*36*), Walker (*64*), et al. Objective encephalographic measurements and ratios are important as described by Evans (*18, 19*), Troland, Baxter, and Schatzki (*63*); and Schatzki, Baxter, and Troland (*54*).

Surgical procedures are occasionally indicated on the basis of clinical data. In such instances, lesions may be verified, such as porencephaly, hematoma, cortical scars, etc. Improvement or arrest in the pathological process may result depending upon the etiology. Postmortem data is also of inestimable value when available, for identification and localization of the responsible lesion.

Summary

The various neurological methods of examination useful in the investigation of cases of delayed speech have been presented. It is not meant to imply, however, that a single specialty field or an isolated part of the individual represents the only available approach or answer in these instances. It is important, rather, to recognize and emphasize the total situation following the principles of gestalt and organismic psychology as well as the more localizing physical and neurological features in the adequate evaluation of problems of this type. This plan will allow a much better understanding of the patient's symptoms, enable a more accurate diagnosis, estimate the prognosis, and determine therapy in terms of the over-all needs of the individual.

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The Clinical Significance of the Stretch Reflex in Speech Reeducation for the Spastic

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and
Robert Harrington

THIS article is written in an attempt to explain one difference in muscle behavior peculiar to spastic muscle, as opposed to all other conditions resulting from neural destruction, including athetosis, rigidity, ataxia, and flaccidity. Those conditions which characterize the spastic state are '. . . a *lowered threshold* of the stretch reflex, together with an *enlarged reflexogenic area*, an *augmented response* and a tendency to *repetition, synchronization,* and *irradiation*'; however '. . . the basic feature of the spastic state is an exaggeration of the spinal stretch-reflex' (*4*). Obviously much of the success of the speech therapist will depend upon the validity of the differential diagnosis of the condition which contributes to the muscle incoordination with which he must work. While the presence of an exaggerated stretch reflex is diagnostically significant in the condition of spasticity, it is normal in athetosis and rigidity and may be reduced or absent in ataxia and in flaccid conditions of the muscles (*4*).

In 1898 Sherrington (cited, 3) found that in decerebrate rigidity tonus was not distributed indiscriminately throughout the body of the organism but was most marked in those muscles which counteract gravity. According to him, the typical picture of one so involved is that of rigid extension of the limbs, and tight adduction of the jaw, the latter through the action of the masseter and temporal muscles. Such an animal, he said, simulates 'reflex standing.' Fulton (3) says:

> . . . the stretch reflex is most fully developed in the muscles of physiological extension: muscles that counteract the force of gravity, and so permit the organism to maintain a posture in the face of gravitational attraction. Included in this group with the extensor muscles of the limb joints are the *elevators of the lower jaw.* (Italics ours.)

It has been known since the work of de Watteville (cited *7*) in 1886 that the muscles of the lower jaw were particularly susceptible to stretch.

Wartenburg (*7*) says that a most violent jaw reflex may be accomplished by means of quick action of a tongue blade which has been placed on the back of the tongue itself. It would appear that, at least as far as use with the spastic is concerned, manipulative techniques relating to tongue and jaw activity should be used with caution.

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It should be noted, however, that any muscle, even a spastic one, may be manipulated without eliciting the stretch reflex. As Wartenburg (*7*) says:

> It is permissible from a physiologic standpoint to assume that every striated muscle, as it contracts on direct mechanical, electrical or voluntary stimulation, contracts also on reflexive stimulation. The most important reflexive stimulus for the muscle consists of a sudden, brief concussion and stretching of the muscle tissue. Here the most essential stimulus—perhaps the only one—is a *sudden, quick pull,* exerted longitudinally. The emphasis lies on the *sharpness* and *brevity* of the stroke. A slow stroke, even though its range is greater, is ineffective. The muscle reacts to this sudden stretching with contraction, which constitutes what is called the deep, or tendon, reflex. In general, when one speaks of a deep reflex as a muscle stretch reflex, one has in mind a sudden, brisk stretching, a jarring of the muscle, so to speak, and not a slow stretching, which leads to a change in position. (Italics ours.)

Apparently the *speed* at which the spastic muscle is moved is a crucial point and is worthy of further consideration. According to Fulton (*1*) 'The sloping of the initial portion of the reflex is more pronounced when the stretch is delivered rapidly. . . . The phasic portion of the reflex is, in other words, more pronounced in response to rapid stretch than when the stretch is delivered slowly.' The length to which a muscle is stretched is of less importance than the speed at which it is manipulated, because, according to Fulton (*1*), the stretch reflex may be elicited by a stretch of less than one per cent of the total muscle length.

One of the goals of physical therapy with the spastic is that of 'forcing back' the point of excitation of the stretch reflex. It is known that improper physical therapy 'draws forward' this point of excitation. Increasing the magnitude of the stretch reflex is accomplished by allowing the muscle to 'snap back,' once it is under stretch. Again the jaw must be considered. Application of manipulative techniques to the mandible of the spastic will probably meet with little success because of the muscular relationships of the jaw. If, for example, the jaw is held in tight adduction, it is virtually impossible to depress the jaw. Yet the therapist must be successful in abducting the jaw, or else the snap-back exerted by the more powerful adductor muscles will make more sensitive the stretch reflex.

The work of Stetson (*6*), in which he investigated experimentally the movements of articulation, would appear to be of some significance in this discussion. According to Stetson there are three fundamental types of muscle movement in any skilled motor activity. Two of these are of interest here —balistic and controlled.

Balistic movement is that in which the entire movement consists of a jerk. This makes it impossible to change the movement during its course.

> . . . the movement is started by a sudden contraction of the positive muscle-group which immediately relaxes. During at least half of the course of the movement . . . the moving member flies free. At the end of its course the movement is usually arrested by the contraction of the negative muscle group. The movement is a movement by momentum. (*6*)

The rapid movements of consonant articulation are balistic.

In controlled movement at least two opposing groups of muscles work together in producing activity. Direction of movement can be changed after it has begun. Such movement is relatively slow and it is controlled throughout its course. 'The slow expiration of air on a prolonged vowel constitutes a "controlled" movement.' (*6*).

In the light of what is known concerning the stretch reflex it would appear that the more a normal rate of articulation in the spastic is encouraged the less successful the therapy will be. For if in normal rapid articulation the movement consists of a jerk, it would appear that the danger of set-

ting off the stretch reflex in the organs of articulation would be obvious. The emphasis at this point is again on rapid articulatory movements. At the risk of incurring the displeasure of the phoneticians, it would seem that the goal of the speech therapist who works with spastics is to make all movements of articulation more 'vowel-like.' That is, emphasis should be on a truly 'controlled' mode of articulation. The therapist should accept and work with the continual contraction of the antagonistic muscle groups rather than expect these antagonistic muscle groups to relax as they do in normals. Their nonrelaxation in the spastic will not permit the balistic movements of normal articulation.

The appreciation of the neuromuscular condition peculiar to the spastic can only lead to the conclusion that the speech goal for the spastic is that of intelligibility and not normalcy. Inasmuch as it is understood that what is sought is the cooperation of antagonistic muscles rather than a freeing of these muscles, drills to 'loosen up' the tongue, lips, etc., are contraindicated, although quite the reverse may be true of the athetoid, as Palmer (5) has recently pointed out.

Much has been written on teaching the spastic voluntary control. It is to be pointed out that what is controlled is muscle movement. Yet there is no such thing as 'controlled' balistic movement. Rather to be sought is a controlled 'controlled' movement which will permit of slower, studied articulation. Practice of this sort will have a tendency to 'push back' the threshold of the stretch reflex and thus permit a freer articulation later.

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Voice Breaks and Pathological Larynx Conditions

E. Thayer Curry

A SURVEY of the available literature regarding the normal voice changes which accompany adolescence in the male has been presented by the author (*3*). More explicit results of an intensive wave-to-wave analysis of voice breaks occurring during the years of change of voice in boys were presented earlier (*2*). The purpose of the present article is to contrast the findings of the author's wave-to-wave analysis with reports of German oscillographic studies of voice breaks observed in conjunction with certain pathological larynx conditions.

The voice break investigations previously reported by this author were carried out by the method of intensive wave-to-wave analysis of frequency changes in the voices of the individuals undergoing change. These results revealed that the most remarkable feature of the particular voice breaks examined was that they always showed an abrupt change in the length of the period[1] from one wave to the next. The type of pitch change in these breaks is fundamentally different from the usual type of inflection in the voice in which the period length changes gradually over a considerable number of successive waves.

In the examination and evaluation of each break, 10 waves immediately before and immediately following the pitch change were considered whenever possible. Previous inspection of a large number of oscillograms indicated that such a procedure gave an adequate measure of the pitches from which and to which the breaks occurred. In general, most of the observed breaks, both upward and downward, were found by measurement to have an extent of one octave. These represented very clear cut and perceptually audible instances of abrupt pitch change with a six tone extent (i.e., one octave).

In examining these voice breaks, however, there were a few instances in which the exact interpretation of the pitch record was not possible. At the 10-year-old level two breaks presented such a chaotic state that they could not be measured with any degree of certainty; seven such occurred at the 14-year-old level. Some other breaks were found in which, between the low and high frequencies reached by the voice, there were chaotic periods during which the frequency could not be measured with certainty. It will be observed later that these momentary chaotic conditions have certain counterparts in the records of the voices of the individuals with pathologic larynx conditions.

Aside from the small number of unusual and infrequent breaks which could not be completely evaluated, the pitches from which both upward and downward voice breaks occurred were within a relatively narrow frequency range. Considering the upward breaks of the 10-year-old subjects, for example, all 11 occurred within a three-tone range. This previous investigation is summarized:

> . . . two points have been noted with regard to voice breaks which seem of importance: first, in both the ten- and fourteen-year old subjects, the breaks occurred below the median pitch, i.e., the typical location of the breaks was between the median pitch and a point

[1]Duration of one cycle, i.e., the reciprocal of the frequency.

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one octave below; second, the average and also the mode extent of breaks is approximately one octave. An interpretation of these findings is entirely a matter of speculation at the present time. When the abruptness of the breaks is considered it seems unlikely that they are of the nature of the ordinary neuromuscular changes which produce normal variations in intonation. The fact that the breaks seem typically to be one octave in extent suggests that the phenomenon may be analogous to that found in an overblown pipe, in which an increase in air pressure produces an octave change in the pitch. This view would indicate that fruitful study might be made of changes in breath pressure in adolescent speech. (*2*)

All of these previous investigations have been carried out with normal 10-year-old and 14-year-old subjects who were undergoing change of voice during adolescence. These results may be contrasted with those of W. Berger of Koenigsberg who has reported (*1*) his studies of voice breaks observed in pathological larynx conditions.

Berger's first case deals with left recurrent paralysis in a 72-year-old woman. The oscillographic studies of the voice of this subject show unmistakably an abrupt change of pitch to one-third of the original pitch level. The frequency level before the break was 315 cps; the frequency level after the break was 105 cps. This lowering of the voice occurs within a period of only 3/100 seconds duration. The abrupt change of the pitch of the fundamental is directly preceded over the foregoing nine waves by a lowering of the fundamental from about 340 to 315 cps. All observed breaks in this subject were downward in direction. For this individual Berger has only reported breaks in which the final pitch was one-third that of the pitch before the break. He reports no instance in which the final pitch was one-half that of the pitch before the abrupt change.

Berger's second case is that of a 49-year-old man with a small, broad based, non-fluttering type polyps at the edge of the right vocal lip near the frontal commissur. When this patient intoned the vowel *o* his voice was an octave higher than the normal adult pitch. The voice was hoarse. During the early part of the sustained vowel there was a transitory falsetto 'screeching' accompanying sound. The oscillogram indicated that the patient was having difficulty in establishing a steady fundamental tone. During this transitory period the fundamental varied from 236 to 259 cps in 1/20 of a second; the voice again shows a strong aperiodic hoarseness (the aperiodicity lasting 1/10 of a second on the oscillogram). Then the voice break occurs with the final pitch lower by an octave and now at the normal adult pitch level. During the rest of the vowel the oscillogram indicates great changes in the periodicity and amplitude of the wave form.

Previous views in the literature have attributed the variation in vibration frequencies of the two vocal folds to the dampening influence of the polyp on the vocal-lip concerned. These unequal vibration frequencies have been referred to by the elder Gutzmann as 'subtonal-grumble-tones.' Such subtonal fluttertones, however, are not necessarily connected only with the presence of polyps or other organic involvements. Berger feels that such vibrations can be demonstrated in so-called functional disturbances involving coordination difficulty.

In this regard, case three is that of a 16-year-old girl who had suffered from a laryngial papiloma since earliest childhood. A few months before the records on this subject were obtained, the papiloma had been successfully removed. Until the time of this operation the patient had been practically voiceless throughout her life. The oscillograms were taken as she was just learning to produce a total speech, and she was continuously interrupted by abrupt voice breaks apparently due to incomplete coordination of the individual structures engaged in voice production. Yet the larynx presented a completely normal anatomical picture at this time with white and sharply edged vocal lips.

The continual breaking of the voice occurred from a deeper to a somewhat higher pitch, whereby the voice shifted from the hoarse chest voice to an unpleasant rasping falsetto. Most of the time this subject intoned the vowel with both vocal folds vibrating synchronously. During the pitch changes previously described, however, the break was not always a clearcut abrupt change. In many occasions the break was accompanied by the appearance of the fluttering diplophonic vibration previously referred to. In this subject the break of the voice was preceded by an apparently involuntary rise in the pitch of the fundamental. With the break into the higher register the fundamental continues to rise still higher in pitch. Berger attributes these variations in the fundamental to a sudden change in the manner of vibration of the individual vocal-lips.

Case four is that of a 23-year-old girl with a mutation disorder; since age eight her voice had been continuously hoarse and accompanied by many involuntary breaks. These breaks from a higher to a lower pitch took place so rapidly that the voice was originally diagnosed as diplophonic. In this instance, however, the apparent diplophonia is due to a rapid succession of different fundamentals rather than different rates of vibration of the two individual cords. This case is of especial note because the difference between the two frequencies is not necessarily an octave. This individual exhibits frequencies which occur in the relation of 1:3, 2:3 and 3:4.

Case five is that of a 19-year-old man who stated that he had voice breaks since the age of one year. The period of voice change began at age 18 and was unusually prolonged. Following each voice break the voice had a very unpleasant quality. The oscillograms on this patient show breaks upward from 130 to 260 cps.

Berger's observations on these pathological cases show the following interesting aspects when contrasted with this author's studies of voice breaks in normal voice change:

(1) Berger cites oscillograms indicating a drop in pitch over a voice break to a pitch level of one-third of the original fundamental. The normal subjects all evidenced a break downward of very nearly one octave, i.e., to a pitch one-half that of the original level.

(2) The pathological subjects show considerable variation of the fundamental both before and after the break. Normal cases did not evidence such a variation in the fundamental.

(3) Berger cites a case of diplophonia in an individual with a larynx described as anatomically normal.

(4) Berger cites a case of apparent diplophonia in which the cords were vibrating synchronously but were changing the pitch so rapidly over breaks, both upward and downward, that the speech was diagnosed (before the oscillograms were obtained) as diplophonia.

(5) Most of the voice breaks of normal subjects did not exhibit breaks to one-third of the original pitch, or variation in the fundamental of the type observed in Berger's oscillograms. Berger's suggestion of a type of apparent 'functional' voice break may indicate further investigation of some of our normal voice change subjects.

(6) This author observed that certain of the normal individuals did exhibit rather confused pitch conditions accompanying voice breaks. These so-called chaotic pitch conditions were also evident in most of Berger's pathological cases.

(7) The pathologic cases seemed to evidence a typical breaking frequency for each individual. In contrast, the normal subjects displayed a more closely knit vocal behavior when they were examined by age groups.

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Lingual Anomalies Associated with Palatal Clefts

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ALMOST two thousand years have gone by since Celsus (cited *8*) (42 B. C.-A. D. 37) observed that 'defects in the lip, if they be small may be cured; if considerable they either do not admit of a cure, or by the cure itself are so deformed that they were less offensive before.' In the second century, A. D., Galen (*5*) gave the defect the classic, if somewhat inaccurate, description of *logocheilos*, a 'lip like a hare.' In the succeeding centuries attention of the oral surgeon and researcher was focused quite naturally upon the possible methods of reduction and closure of the cleft. For the last quarter century the most widely accepted criterion of successful surgery has been the degree of normality of speech. It is singular, therefore, that the oral surgeon did not observe that all speech problems could not be solved by palatal repair followed by speech therapy, and that there were, in fact, pronounced articulatory defects unrelated to palatal function which appeared with more than coincidental frequency in this group.

It is the purpose of the writer to record observations on the nature of these associated articulatory defects and to suggest structural anomalies of the tongue as a possible cause. In the past decade, several hundred children with facial clefts have been referred for speech therapy to the Rockford College Speech Center. Referrals have come from physicians, welfare agencies and public school teachers. The largest group, however, has been referred by the Division of Services for Crippled Children of the University of Illinois. Through the cooperation of its director and its speech therapist, it has been possible to make an intensive study of the speech problems of these children after surgical repair has been completed.

In analyzing the phonetic and voice problems it was found that many of the phonetic difficulties were unrelated to the palatal or labial cleft. It is true that all sounds might be affected by an excessive nasal resonance, but certain sounds, [t], [d], [l], [s], [z], [ʃ], and [ʒ], were found to be defective because the tongue did not make the proper articulatory adjustments. Close observation and testing of the tongue action made clear that in 65% of the cases the tongue lacked the requisite mobility and muscular coordination for the normal production of these sounds. These children found it impossible to point the tip of the tongue either inside or outside of the mouth —a function of the anterior fibers of the genioglossus and of the transverse lingualis muscles. In attempts to raise and extend the apex of the tongue, the lingual fascia (in which the genio-glossus muscle is inserted) and the mylohyoid muscle apparently are drawn upward and forward with the genio-glossus. This action may be an attempt to compensate for the failure of the genio-glossus muscles. These children also were unable to produce

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a central channel along the median raphé of the tongue by raising the sides and depressing the central portion of the tip and blade. This is a requisite for the production of [s], [z], [ʃ], and [ʒ], and involves the action of both the anterior and posterior fibers of the genio-glossus muscles. Although the frenulum was not abnormally short, the tongue often became bifid when directed toward the alveolar ridge. Rapidity of movement, so essential to connected speech, was markedly below the norm. Less than two per cent of the children could produce a tongue 'tap' or 'trill,' a test of the mobility of the tongue tip. Photographs and slides of the functioning of the tongues of this group, compared with slides of tongue mobility of a group of children of the same age possessing normal speech, reinforce our observation that many phonetic problems of the cleft palate group may be traced to defective lingual function.

Discussion of the Finding

Several investigators have called attention to the unusual number of defective sounds in the speech of these children but they have not suggested a structural defect as a cause. Kantner (*6*) states, 'Mixed in with those articulatory symptoms that can logically be attributed to the cleft palate, one frequently finds others that are more characteristic of a general speech retardation or of a hearing loss,' and later, 'More specifically an attempt to appraise the relationship between anomalies of the teeth and jaws and articulatory defects cannot be complete without at least a parallel appraisal of the muscular coordination of the tongue and the integrity of the hearing mechanism.' In an earlier article, Eckelmann and Baldridge (*4*) note that '. . . the following sounds are likely to be distorted or replaced by other sounds: [h], [b], [p], [t], [d], [s], [ʃ], [tʃ], [f], [v], [θ], [ð], [w], [k], and [g].' Madsen (*7*) also calls attention to the presence of 'indistinct articulation with a complete closure of the naso-pharyngeal port.' Later Madsen states:

> It is the opinion of our staff that articulatory problems in cleft palate patients are not always and perhaps not primarily causally related to structural deformities, but show a speech characteristic and possible etiological factor similar to the articulation cases having no oral deformity.

Von Axhausen (*2*) recognizes certain deviations (Abwegigkeiten), defects of articulation unrelated to the palatal cleft but characteristic of children with cleft palates. ('Indessen bestehen noch Maugel der Articulation, wid sie fur die Gaumenspaltenkinder charakteristisch sind.') Brown (*3*), eminent oral surgeon, describes a type of congenital cleft in the tongue as a 'lobulated tongue' and notes the presence of the defect in a child whom he treated for a palatal cleft. He continues:

> By no means invariably but quite frequently either the father or the mother of a cleft palate patient has some peculiarity of speech. In none of these cases has the peculiarity been noticed or associated in any way with cleft palate, and though quite impossible to examine all cases, it is fair to assume that in outward appearance of the palate there was no defect. It would seem, then, that there must be in these individuals either a nervous inefficiency in the speech mechanism or a slight imperfection of anatomical development, either of which in the next generation has become exaggerated through inheritance in the speech difficulty of their offspring. Many persons whose palates are only slightly imperfect, the uvula being bifid and both velum and hard palate apparently complete, have marked speech defects.

In order to make clear the relationship which may exist between palatal and lingual anomalies, it is necessary to review briefly the formation of mandible, maxilla and the tongue. The oral cavity develops from the stomadeum, a depression on the ventral surface of the cephalad section of the embryonic gut. The deepening depression results in the union by apposition of the ectoderm and entoderm forming in this

way the stomadeal plate. At four weeks the oral plate ruptures, forming an opening; the surrounding structures encircle it producing the oral cavity. From the pharyngeal pouches caudal to the oral cavity arise the mandibular arch, the hyoid arch and three primitive gill arches.

The more complex development is involved in the formations of the maxilla and palate. Three embryonal processes, the fronto-nasal process and two lateral maxillary processes, must unite. At the sixth week the maxillary processes grow very rapidly toward the midline, crowding the medial and lateral limbs of the nasal processes so that they are united finally in the midline and fuse laterally with the maxillary processes. From the maxillary processes, now in the seventh week, emerge two shelves which will form the main body of the palate. At this stage of embryonic development, however, the tongue is a relatively enormous organ. By the seventh week it has grown markedly in length and breadth and is taking up its position between the maxillary arches; it fills the oral cavity. As a result of the obstruction by the tongue, the palatal primordia 'are directed obliquely downward so that the margins lie along the floor of the mouth on either side of the root of the tongue' (*9*). Somewhat later, the floor of the mouth sinks, the tongue is flattened and so permits the palatal shelves to curve upward again and shift toward the horizontal plane. In the most rostral region the small triangular premaxillary process (median palatine process) which lies between the palatine shelves now fuses with them. By the ninth week union proceeding from the front backward is practically complete.

The several parts of the tongue have diverse origins. The membraneous sac which develops first originates in the internal lateral swellings on the mandibular arch in the fifth week. This ectodermal covering extends as far back as the foramen caecum. The covering for the root of the tongue is entodermal and once covered the ventral areas of the second, third and fourth visceral arches. On the other hand, the muscles of the tongue originate much further back in the mesoderm on the floor of the pharynx directly opposite the origin of the hypoglossal nerve; they migrate forward as paired muscles to fill the membraneous sac. Whether the homologous muscles interdigitate is still debatable. Patten (*9*) contends that they remain clear of the midline because one can make a median incision of the tongue with little bleeding. Arey (*1*) and others contend that the fasciculi of the muscles are blended and that there is some interdigitating of the muscles.

Despite these areas of disagreement on the embryology of the tongue, it seems reasonable to suggest that there may be clefts in the tongue as well as in the mandible, lips or palate. The homologous members of the transverse lingualis muscle, for example, may not fuse at the median septum, they may not originate precisely at the septal line, or they may not extend to the normal insertion in the fibrous tissue at the sides of the tongue. If any one of these conditions obtained, it could provide an area of asynergic function. Such a possibility might account for the bifid apex of the tongue. Simliarly, the fibers of the genioglossus muscle which has its origin in the mental spine of the mandible and insertion in the lingual fascia may not be interdigitated or even united at the point of origin or insertion. Finally, if the tongue is mobile in embryo it is conceivable that the 'cleftness' of the the muscles may retard its flattening and lowering, thus producing or enlarging the palatal cleft.

Although these are only speculations, it is clear that the muscular action and coordination of the tip and blade of the tongue have been impaired by some anomaly in structure or

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developmental function. Certainly in any prognosis of speech it is necessary for the clinician to reckon not alone with the closure of the nasal port and with the oral emission of the breath stream. It may be equally important to determine to what degree lingual action can be improved. A child 'crippled in the palate' also may be 'crippled in the tongue.'

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Effect of Level of Distracting Noise upon Speaking Rate, Duration and Intensity

T. D. Hanley
and
M. D. Steer

CERTAIN hypotheses form the bases for training procedures in radio-telephone communication. At the Voice Science Laboratory, Purdue University (*2, 3, 4*), as at military and research installations elsewhere, these basic hypotheses have included the following:

(a) successful radio-telephone communication is directly related to speaker intelligibility;
(b) increased intelligibility may be assumed to result from
    1. reduced rate of speaking,
    2. syllable prolongation,
    3. increased intensity of voice signal, and
    4. increased precision of articulation.

Research evidence has been found to support some of these assumptions. In the series of studies edited by Black (*1*), Moore concludes, '. . . for operating both aircraft radios and interphones, loudness of voice is an important factor. . . . For training purposes this can be described as *just under shouting.*' In the same series Draegert states, '. . . training for good articulatory patterns is likely to improve intelligibility.'

Investigations are currently in progress in the Purdue Voice Science Laboratory testing the hypothesis that syllable prolongation is significantly related to intelligibility. Early unpublished reports support this hypothesis strongly. For all the hypotheses listed, there is high face validity.

The study reported here is not concerned with testing these hypotheses. The assumption is made that the hypotheses are valid, and the questions are asked, 'With subjects, not trained in communication technics nor instructed in specific adaptations, are "native" rate, duration, and intensity responses appropriate to communication situations of various levels of difficulty?' and 'Do such responses tend to be related in an ordered manner to the difficulty of the communication situation?'

If the questions which define the problem could be answered affirmatively, the conclusion to be drawn for a training program would follow: subjects tend naturally to make correct rate, duration, and intensity responses to the difficult communication situa-

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TABLE 1. Effect of four levels of distracting noise upon speech variables.

*Speech variables**	*Level of noise in decibels above arbitrary reference level*			
	1.00 db	*6.16 db*	*14.23 db*	*22.23 db*
Words per minute				
Mean	183.2	174.5	169.4	165.4
S. D.	20.0	18.0	20.7	21.9
Mean syllable duration (in seconds) Mean	.109	.143	.158	.167
S. D.	.022	.020	.026	.028
Mean speech intensity level (in db above an arbitrary reference)				
Mean	1.8	4.1	5.8	7.0
S. D.	.9	1.8	2.4	3.1

*Magnitude of difference between means required for statistical significance (*t*-test):

Difference required	*at 5% level*	*at 1% level*
Words per minute	8.2	10.8
Mean syllable duration	.010	.013
Mean speech intensity level	.9	1.2

tion; therefore, only enough time need be spent on those factors to bring the responses to optimal levels, and training should be concentrated in those areas in which subjects do not respond appropriately to the stimuli of the difficult communication situation.

In investigating the problem as defined, an experiment was designed to determine the effect of four levels of distracting noise on words spoken per minute, mean syllable duration, and mean speech intensity level above an arbitrary reference. The subjects were 48 randomly-selected male undergraduates from an elementary public speaking course in Purdue University. They were brought individually into a sound-treated chamber and informed that they were to take part in an experiment involving communication in noise. Each student was instructed to read five times, on signal, a 73-word passage given him by the investigator. He was instructed to read the passage into the microphone[1] 'as though communicating the information to a listener on the circuit.' During the readings the subjects wore headphones[2] into which was fed airplane type noise from a noise generator[3] at predetermined levels.

For each subject the first reading, done with a minimum of noise background, constituted a practice reading to familiarize him with the content of the reading passage. No data were collected from the practice readings. The noise levels for the other four readings were .235 v., .425 v., 1.075 v., and 2.700 v.[4]. With .235 v. arbitrarily designated as 1 db, the other three readings were, respectively, 6.16 db, 14.23 db, and 22.23 db. The order in which the four noise levels was presented to succes-

[1]Chest microphone, Carbon, Type T-26.

[2]Headphones type ANB-H-1a.

[3]Portable Interphone Trainer, Navy Device 8-I.

[4]As measured at the headphone by Ballantine Model 300 Electronic Voltmeter; 2.7 volts at the headphone represented 254 bars of sound pressure as measured by Ballantine Artificial Ear, type 505.

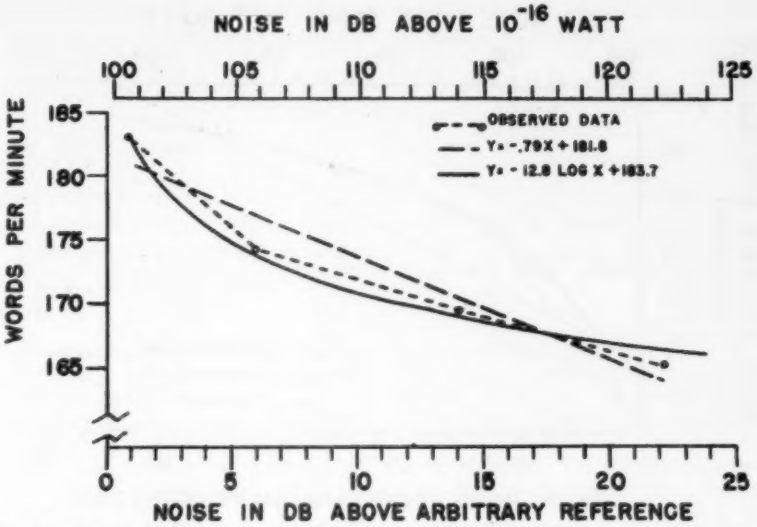

FIGURE 1. Relation between rate in words per minute and distracting noise in db above arbitrary reference.

sive subjects was varied permutationally. Since the four conditions could be presented in 24 possible combinations, all combinations were used twice with the 48 subjects participating. The reason for the systematic variation of the order of presentation was to prevent reading practice effect from favoring any single noise condition.

For each reading of the passage by each subject, the following data were collected:

(a) total time used to read the passage, determined by stop watch;
(b) time spent in the production of voice signals strong enough to energize the Purdue Speech Sound timer;[5]
(c) a graphic record of the intensity of the voice signal as traced by a High Speed Power Level Recorder.[6]

Since the number of words and the number of syllables in each word[7] of the passage was known, the following data for each reading by each subject

[5]An electric clock, graduated in hundredths of a second, with associated triggering circuit.
[6]Model HPL-E, manufactured by Sound Apparatus Co., Stirling, N. J.
[7]Syllables per word according to Webster's Collegiate Dictionary, Fifth Edition.

TABLE 2. Significance of differences noted in Table 1, by analysis of variance.

Speech variables	*Variance**		*F***
	Between groups	*Within groups*	
Words per minute	2842.28	417.71	6.80
Mean syllable duration	.0308	.0006	51.33
Mean speech intensity level	242.01	4.98	48.60

*d.f. 3 and 188
**Value of F required for significance at 1% level=3.88

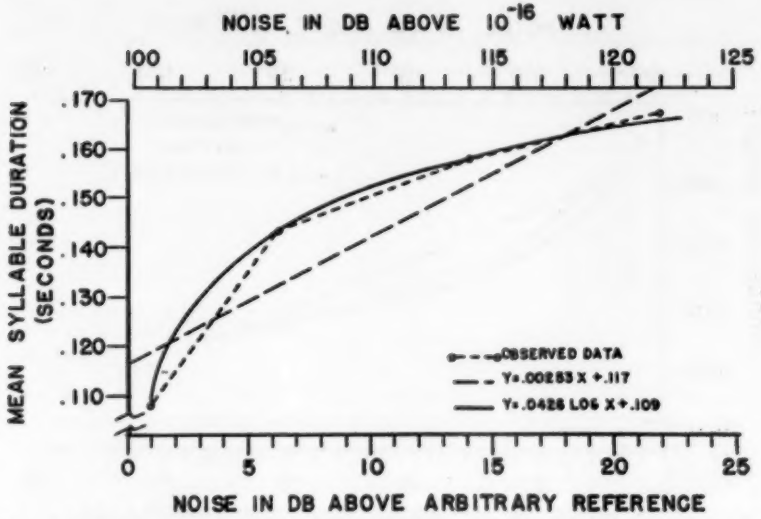

FIGURE 2. Relation between mean syllable duration in seconds and distracting noise in db above arbitrary reference.

could be calculated simply from the physical measures obtained:

(a) Words per minute: 60 seconds divided by stop watch indication in seconds, the quotient multiplied by number of words in the passage;

(b) Mean syllable duration: measurement on Purdue Speech Sound Timer divided by number of syllables in the passage;

(c) Mean intensity level: tape used in the High Speed Power Level Recorder is divided into 5 db intervals by parallel lines. Values of the syllabic peaks traced by the stylus were determined with respect to the 5 db line markers. Those peak values were summed, then divided by the number of peaks to give a mean peak value for each reading for each subject.[8]

Results of the experiment are summarized in Tables 1 through 3 and in Figures 1, 2, and 3. It will be observed from Table 1 that as noise in the headphones was made more intense subjects tended to speak at successively slower rates of speed, to increase syllable duration, and to speak with greater intensity. Analysis of variance applied to the data of Table 1 to test the significance of differences assumed to be related to the difficulty of the four communication situations resulted in F-ratios for the speech variables that were considerably larger than the value required for significance at the 1% level of confidence (Table 2). As may be observed from data cited in the footnote to Table 1, however, not all differences between individual means are found to be statistically significant. With respect to *Words per minute,* for example, only one of the differences between values in adjacent columns in the table is significant at even the 5% level. In contrast, differences between means in adjacent columns for *Mean speech intensity level* all are statistically significant at the 1% level.

[8]It is to be noted that these computations were not absolute intensity values, but were relative to the threshold of the instrument. It is also to be noted that this instrument records not instantaneous peak values, but r.m.s. values for successive waves.

TABLE 3. Relationships between levels of distracting noise and variables of speech.

Speech variables	*r**	*epsilon**
Words per minute	−.30	.29
Mean syllable duration	.62	.67
Mean speech intensity level (in db above arbitrary reference level)	.64	.65

* The Pearson product-moment coefficient of rectilinear correlation.
** Epsilon gives an index of the strength of relationship without regard to the ordering of classes along an x-axis.

Straight lines were fitted to the observed data by the method of least squares. Logarithmic curves of the type $y = a \log x + b$ were fitted also. In Figure 1, the graph for words per minute, both straight line and logarithmic curves provided a good fit to the observed values as tested by the Epsilon-prime-square test of goodness of fit. In Figure 2, for mean syllable duration, the fitted straight line may be be seen to depart widely at some points from the observed values. The fitted logarithmic curve, however, provides an excellent fit when tested with the epsilon - prime - square statistic. For mean speech intensity level (Figure 3), as with words per minute, the fitted straight line provided sufficient explanation for the shape of the curve for observed values. The logarithmic curve may be seen by inspection, however, to follow the shape of the curve of observed values very closely.

Table 3 demonstrates the moderate-to-strong relationship found between level of distracting noise and the speech variables investigated. It will be noted that when no assumption of rectilinearity is made (the epsilon

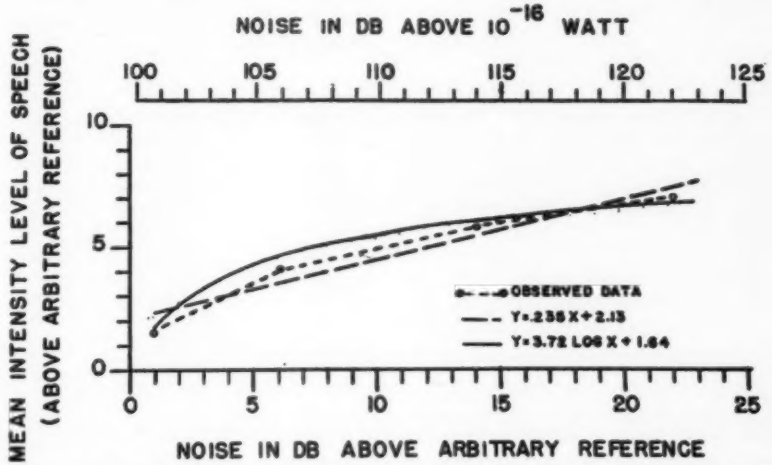

FIGURE 3. Relation between mean intensity level of speech and distracting noise in db above an arbitrary reference.

statistic) the correlation is even higher.

Within the limits of the experiment, the following conclusion is offered: if subjects who have not been trained to communicate against a noise barrier are confronted with a communication problem in the presence of noise, they tend to react in what has been assumed to be a desirable manner. That is, subjects reduce rate of speaking, prolong syllables, and speak with greater intensity as noise increases. Subjects' responses to noise may be shown by a logarithmic function of the type $y=a \log x + b$. At the lower levels, there is a strong response to a given increase in noise barrier. In the upper levels of noise, the response becomes less intense as the subjects' limits of response potentialities are approached.

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Intelligibility Testing in Three Conditions Involving Masking Noise

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and

M. D. Steer

In August, 1947, a study was undertaken to determine whether or not high level simulated aircraft noise background was essential for the training of military communicators (*1*). In order to determine the effect of noise, subjects were trained under five conditions of masking noise. Each of these masking noises was difficult enough to provide a barrier to intelligible communication by radio-telephone, yet four of the practice conditions employed noise with the intensity reduced from that of the normal testing situation. That experiment indicated that barrier noise of high intensity was less effective in training than masking noises of somewhat lower intensities; also, that specific training was more effective than no special training.

If it may be concluded that high level masking noise is not critical to training, it is believed to be desirable to test the hypothesis that this same high level noise is not critical to intelligibility testing. The purpose of this study may be stated by the following questions:

(1) Are intelligibility scores obtained under conditions of reduced signal and noise comparable to scores obtained under customary high levels of masking noise?

(2) Are test scores obtained under conditions of reduced levels of masking noise and speech signal satisfactorily reliable?

(3) What relations occur between test scores obtained under different intensities of masking noise, if signal-to-noise ratio remains constant?

Subjects

The subjects employed in this study were 40 male students selected in a manner that was essentially random from sections of an elementary course in public speaking at Purdue University. Other investigations have indicated that in young adult college populations age, intelligence, and previous experience with communication equipment do not significantly affect intelligibility scores.

Equipment and Procedure

The subjects were tested in groups of seven. Six listener stations were established in a sound-proof room and one speaker station was set up in an adjoining room. Each member of the

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listening panel was in turn a speaker. Each speaker read three forms of the Twenty-four Word Multiple-Choice Word Intelligibility Test developed at the Voice Communication Laboratory, Waco, Texas, during World War II (*3*). These tests were read consecutively over the same microphone (RS-38-A) and heard by the same panel of listeners under identical conditions of transmission with two exceptions: (a) tests were rotated, the first speaker reading A-B-C, the second B-C-A, and the third C-A-B, and so on; (b) the conditions of noise were also rotated so that with three conditions the order was 1-2-3 for the first speaker, 2-3-1 for the second, and 3-1-2 for the third, and so on. In this manner, each of the 40 speakers participated in all three test conditions.

The equipment employed consisted of Device 8-I, Portable Interphone Trainer, used as a transmission system and noise generator. The testing condition designated Number 1 was the test condition previously used in all tests and reported in detail in previous reports (*1*).[1] By means of an attenuator device in the output of Device 8-I, it was possible to use test condition designated Number 2, with both speech and masking noise attenuated by 10 db, or test condition designated Number 3 with both speech and masking noise attenuated 20 db. Thus it was possible to establish three conditions of testing, the first being the standard test condition, and the second and third attenuated 10 and 20 db, respectively, for both speech and noise. Thus the same or approximate signal-to-noise ratio was maintained, the only variability possible being the loudness at which each speaker might speak from one condition to the next.

[1]Standard test conditions included six to 10 men on a party-line telephone circuit using carbon microphones and dynamic headphones. The speech amplifier was flat ± 3 db from 50 c.p.s. to 20,000 c.p.s. Speech amplifier gain was 16.9 db at 1000 c.p.s. Barrier noise of aircraft type was mixed electrically with the speech signal in the Device 8-I. The over-all noise level was approximately 107 db at the subjects' ears. 0 db = 10^{-16} watt.

Results

Results may be discussed in relation to the questions previously asked:

(1) Are intelligibility scores obtained under conditions of reduced signal and noise comparable to scores obtained under customary high levels of masking noise?

Table 1 indicates the means and standard deviations of intelligibility test scores obtained under three different conditions of noise. The mean for Condition 1, standard test condition, was 52.12% with a standard deviation of 11.02. The mean of scores obtained with a 10 db reduction of speech and noise was 50.85% with a standard deviation of 11.17. The mean score for tests conducted under Condition 3, 20 db attenuation of noise and speech, was 48.42% with a standard deviation of 14.30.

Table 1. Word intelligibility scores under three conditions of noise: 1, standard level; 2, minus 10 db; 3, minus 20 db.

	Mean	*S.D.*
Condition 1	52.12	11.02
Condition 2	50.85	11.17
Condition 3	48.42	14.30

An analysis of variance based upon intelligibility scores of speakers under the three conditions of noise and signal intensity indicates no significant difference among conditions. The F obtained was .916, and a value of 3.08 is necessary for significance at the 5% level of confidence for the degrees of freedom involved. Table 2 shows a summary of the analysis of variance computations.

(2) Are test scores obtained under conditions of reduced levels of masking noise and speech signal satisfactorily reliable?

TABLE 2. Analysis of variance based upon intelligibility scores of speakers under three conditions of noise and signal intensity: 1, standard levels; 2, minus 10 db; 3, minus 20 db.

Source	*d.f.*	*Sum of Squares*	*Variance*
Between means of conditions	2	282.62	141.31
Within conditions	117	18041.25	154.20
Total	119	18323.87	295.51

$$F = \frac{141.31}{154.20} = .916$$

For significance at 5% level, F of 3.08 is necessary.

Table 3 indicates the computed reliability of word intelligibility tests given under three conditions of noise. When the standard test situation was employed the obtained coefficient of reliability (correlation between split halves, corrected for attenuation by the Spearman-Brown prophecy formula) was .65, which is comparable to other obtained reliability estimates with listener panels of this size (*2*). With the same number of listeners the reliability of the word intelligibility test under Condition 2 was found to be somewhat greater, .70. Under Condition 3 the obtained reliability of the word intelligibility test was .78. All estimates of reliability for the three tests are as high as previously reported for this test when listener panels of equal size were used. It was noted, however, that with the samples tested, as the noise was reduced the reliability of the test increased progressively.

TABLE 3. Reliability of the word intelligibility test under three conditions of noise: 1, standard levels; 2, minus 10 db; 3, minus 20 db.

	*r**
Condition 1	.65
Condition 2	.70
Condition 3	.78

*All correlations have been corrected for length by the Spearman-Brown prophecy formula.

(3) What relations occur between test scores obtained under different intensities of masking noise, if signal-to-noise ratio remains constant?

Table 4 lists coefficients of correlation found for intelligibility scores obtained under the different test conditions. The obtained r of .61 for Condition 1 (standard)-Condition 2 (signal and noise both reduced 10 db) scores is comparable to reported test-retest correlations for the test. The r for Condition 1-Condition 3 (20 db attenuation of signal and noise) scores was found to be still higher, .75. The largest r, .77, was obtained for the data of Condition 2-Condition 3. These coefficients are as high as any reported test-retest r's for this intelligibility test (2).

TABLE 4. Coefficients of correlation between scores under differing noise conditions: 1, standard levels; 2, minus 10 db; 3, minus 20 db.

	r
Condition 1 vs. Condition 2	.61
Condition 1 vs. Condition 3	.75
Condition 2 vs. Condition 3	.77

SUMMARY AND CONCLUSIONS

This study was undertaken as a companion study to an investigation entitled "An Experimental Comparison of Five Conditions of Noise." The hypothesis tested is that if signal-to-noise ratio is held essentially constant, scores of intelligibility tests obtained under three different sound levels do not show significant differences.

Forty subjects selected randomly from a beginning course in public speaking were given three forms of the VCL 24-Word Multiple-Choice In-

telligibility Test under (a) the standard setting of Device 8-I with 107 db masking noise level, (b) noise and speech reduced 10 db, and (c) noise and speech reduced 20 db. Results of the experiment form the bases for the following tentative conclusions:

(1) Scores on word intelligibility tests under conditions where noise and speech intensities are reduced by 10 and 20 db from the previously recommended levels do not differ by statistically significant amounts from scores achieved under the standard test condition.

(2) No loss in test reliability need be anticipated with the reduction in noise level and speech channel gain.

(3) Coefficients of correlation ranging from .61 to .77 for arrays of data obtained under similar signal-to-noise ratios but progressively attenuated sound levels are construed to be further evidence that reduced noise and speech level intelligibility testing may produce substantially the same results as testing in high level noise.

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Hearing Aid Amplification for Optimum Speech Reproduction

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and
LeRoy D. Hedgecock

EXTENSIVE research in the area of hearing aid performance has been done with a Master Hearing Aid by Davis and his co-workers (*3*) at Harvard University. Based upon their findings, Davis et al devised a set of 'ideal' specifications of design objectives for hearing aids. They suggested that two or three models, differing primarily with respect to acoustic gain, maximum power, size and cost, should be sufficient to cover the needs of all users, especially since an adjustable tone-control mechanism could encompass the entire necessary variety of frequency patterns. These major specifications include a uniform frequency response from 300 to 4000 cycles per second; a tone control element providing selection among flat, rising three decibels, and rising six decibels per octave frequency characteristics; and a limitation of output by peak clipping or compression amplification. Their findings indicated that most persons with marked hearing losses get best results in speech comprehension when they listen to an instrument with a flat acoustic response or a response which is slightly tilted for the higher frequencies. These results were obtained on the basis of extensive tests carried out with 18 hard of hearing subjects.

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Hudgins et al (*6*) performed another study which compared the performance of the Master Hearing Aid, an experimental hearing aid, and two commercial hearing aids in a test situation. Six hard of hearing persons, representing a diversity of types and degrees of hearing loss, served as subjects for this experiment. The procedure was generally similar to that of the Harvard study cited above. The authors confirm the findings of the previous study, concluding that all types of hard of hearing subjects give a better performance with a sound system which provides adequate gain and a relatively broad, flat frequency response.

A major purpose of the present study was to ascertain if the same general results would obtain when a relatively large number of hard of hearing individuals was tested with three different response patterns of a commercial hearing aid.

SUBJECTS

The persons who formed the experimental group for this study were obtained through the files of Minneapolis hearing aid representatives. Form letters requesting cooperation with the project were sent to individuals who appeared to fit arbitrary criteria which had been established to minimize the participation of persons who would obviously be unsuited to the purposes of the study, such as very aged persons or those with no measurable hearing. The age range of the subjects used

was from 15 through 78 years, with the mean at 49.17 years and a standard deviation of 12.76.

A total of 105 persons were used in the study. Of these, 41 were male and 64 were female. Every subject was a regular hearing aid wearer and had been wearing an instrument at least a year. The average length of hearing aid use was 4.30 years, with a range from one to 37 years. Subjects were in the habit of wearing their instruments from two to 18 hours daily, with the mean at 9.28 hours. All subjects had measurable hearing in both ears. No attempt was made to select subjects on the basis of the type or degree of deafness involved in the individual cases.

Experimental Equipment

The experiment was conducted in a sound-treated chamber with an adjoining control room at the acoustical laboratories of the Maico Company of Minneapolis. In this situation a battery of pure tone and speech intelligibility tests could be administered under controlled conditions. Each subject was tested individually over a three hour period. Tests administered included an audiometric pure tone threshold, a free field pure tone audiogram, a speech reception threshold with Harvard spondaic words, and a speech intelligibility test using Harvard phonetically balanced (PB) words. In addition, pure tone equal loudness contours were obtained for 61 of the subjects, and tolerance levels were established for 83 subjects. All word tests originated from gain controlled phonographic recordings produced by the Research Department of the Central Institute for the Deaf.

During all phases of the testing sequence, subjects were seated in the sound-treated room, while, except for preliminary monaural measures, the experimenters remained in the control room. The hard of hearing individual was seated before a loudspeaker through which the stimulus tones and words were directed. Communication between rooms was carried on by means of a talk-back system.

The usable inside dimensions of the test room were approximately 10′x15′x9′. The ambient noise level was less than 25 db. Equipment located inside the sound-treated room consisted of an Altec-Lansing duplex speaker, a Maico E-1 audiometer, and a 'talk-back' microphone. The speaker was mounted in one corner of the chamber and elevated in such a manner that the center of the cone was at ear level with the subject. During the free field tests the subject was seated three feet from the loudspeaker. The test hearing aid was placed in this same relative position during later parts of the test sequence.

Most of the experimental equipment was located in the adjacent control-room. This apparatus included a specially calibrated E-1 audiometer, which was used as the pure tone generator feeding through a suitable matching network into 10 db. and 1 db. per step power attenuators. The output of these attenuators went to the speaker in the test chamber. A microphone was fed through the microphone channel of the audiometer and then through the power amplifier to the speaker in the sound chamber. This circuit was used in the study solely for the purpose of giving instructions to the subject in the test room. A Maico PR-2 phonographic audiometer was used to administer tests involving recorded speech. The output was fed through the microphone channel of the E-1 audiometer. Both the phonographic and E-1 audiometers were carefully calibrated for output level prior to the beginning of the testing period. Calibration checks were made with 20 persons having normal hearing, using pure-tone thresholds, speech reception thresholds, and speech intelligibility scores. A block diagram of the circuits is shown in Figure 1.

The commercial hearing aid used for this study was the UD model man-

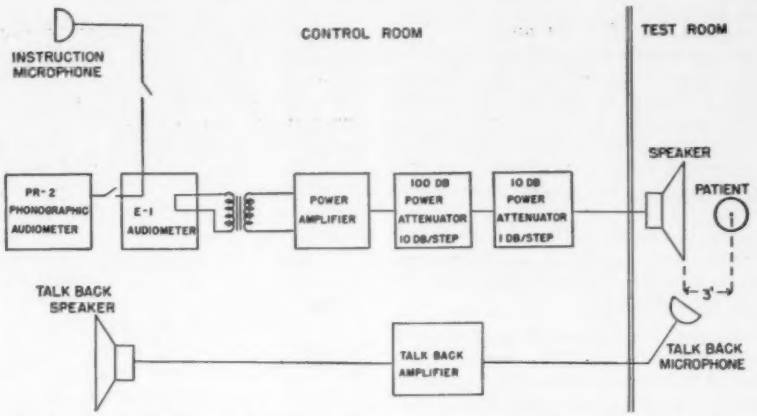

FIGURE 1. Block diagram of equipment used in control-room and sound-treated chamber.

ufactured by the Maico Company. Several other commercial models were considered for use, but the UD instrument was selected for two primary reasons. First, it offered a variety of frequency response adjustments, three of which would approach the flat response, the moderate high-pass, and the high-pass emphasis desired for this experiment. The changes in response could be made easily and quickly. Secondly, should any question arise relative to the UD's characteristics and performance, the experimenter could consult with the acoustic engineers who had designed and produced it. The UD hearing aid is an all-in-one unit, using as power sources a 30 volt 'B' battery and a mercury type RMB-4 'A' cell. Its maximum power output was one milliwatt. The frequency range extended from 250 to 3600 c.p.s. It had an acoustic gain of 65 db. Equipped with the magnetic receiver used for the study, the instrument showed a distortion equal to 2.5 per cent at 1000 c.p.s. with 130 db of output.

Changes in frequency response with the commercial hearing aid were accomplished in two ways. The primary adjustment was made by changing the relationship of two small internal set-screws. A second manner of altering the response pattern was achieved by changing the position of the tone-control switch. On this hearing aid two adjustments of the external tone-control were used, the 'one-dot' and the 'two-dot' positions. In general the one-dot position did not alter the frequency emphasis already established by the set-screw pattern. In the two-dot position, the low frequencies were attenuated while the higher frequencies were emphasized.

Three settings of the hearing aid were used in the study. The first one chosen approached a flat response; the second gave a mild high-tone emphasis in the amount of approximately seven db per octave; the third adjustment resulted in a high-tone emphasis of about 14 db per octave.

PROCEDURE

The testing period averaged three hours. The sequence began with a pure tone audiometric examination for both ears. The audiograms were made in the sound-treated room and were administered with the E-1 audiometer, using a PDR-10 type air receiver. In addition to the regular audiogram, equal loudness contours were obtained for 61 persons of the total group of

subjects. The E-1 audiometer with its two pure-tone channels was used for this procedure. One of the channels was adjusted to put out a constant 1000-cycle tone whose volume was adjusted to a comfortable loudness level according to the evaluation of the given subject. The second channel provided the variable pitches to be adjusted in volume to the 1000-cycle reference tone. Levels of equal loudness were established for frequencies 250 through 8000 c.p.s.

At the conclusion of the monaural audiometric tests, the subject was seated before the loudspeaker mounted in the sound-treated room. He was instructed to maintain his position carefully throughout the series of unaided free field tests which followed. A free field audiogram was obtained first and then the speech reception threshold was determined with spondee words. The subject was instructed to repeat back the words as he heard them through the loudspeaker. His answers were picked up by the 'talk-back' microphone and relayed to the control-room, where they were checked against word lists. At first the stimulus words were put in at a gain level which made them easily understandable. The volume was then decreased gradually until the subject was missing half of the words. This point was taken as the threshold for speech reception. The Harvard spondaic words (*5*) used in establishing this threshold for speech reception are made up of lists of two-syllable words in which each syllable receives approximately equal stress, i.e., *grandson, platform, highway.*

The speech intelligibility test constituted the third portion of the free-field sequence. Harvard phonetically balanced (PB) words (*4*) used for this test were given at a conversational level of volume. The PB words consist of lists of 50 monosyllabic words each. The words were assigned to each list on the basis of initial consonants and vowels. The distribution of sounds follows closely the frequency of occurrence of the sounds in American-English speech. Each of the 20 lists represents a test unit that is interchangeable with any other list. The subject listened to one list of 50 words for each part of the testing sequence, repeating back the words he heard and understood. The scores for this test were expressed as percentages. In order to control the learning effect in giving lists of spondee and PB words, a new list of words was used each time they formed part of a testing sequence.

For establishing the tolerance level for speech, a recorded selection of connected discourse was presented. The intensity was gradually increased until the subject, as previously instructed, announced that the speech was uncomfortably loud. Subjects were uniformly encouraged to tolerate the increasing intensity until pain was actually experienced. At the lower gain levels intensity was increased by five decibel steps, but as the anticipated ceiling was approached, the gain was increased in two decibel steps. The decibel spread between the discomfort level and the speech reception threshold was computed as the tolerance range. Eighty-one of the subjects were tested for tolerance level.

Upon completion of the unaided free field tests, the commercial hearing aid was used in groups of tests similar to the unaided series outlined above. The test instrument was mounted at a point three feet from the loudspeaker in the sound-treated room, in the same relative position occupied by the subject in the unaided tests. The receiver of the hearing aid was attached to the subject's own ear-piece and inserted in the ear habitually used.

The test hearing aid was adjusted by the experimenter for gain level. A group of spondaic words was played over the sound-amplifying system at conversational level, and the volume control on the hearing aid was changed until the subject reported that the words were sounding just comfortably loud. In this regard, it is to be noted

that 'conversational level' was assumed to be 60 db above the normal hearing threshold. This level represents a point approximately 25 db above the aided threshold mentioned by Carhart (*2*). The volume control on the test hearing aid was specially calibrated in order that the amount of gain selected by each subject for each test could be recorded. With the experimenter adjusting the gain as directed by the subject, the latter was unaware of the exact amount of volume being taken, also, how this gain level compared to that of the other two settings of the hearing aid, other than by his own subjective evaluation.

With the test instrument adjusted for the first response setting to be checked, pure tone and speech tests were given. These consisted of a pure-tone audiogram, a speech reception threshold and a speech intelligibility test, the same as given before in the unaided situation. Upon completion of the test sequence with one setting of the instrument, similar series were run with the other two settings. To minimize the effect of fatigue upon test results, the three settings of the hearing aid were rotated from subject to subject. As a basis for further comparison, the subjects' own hearing aids were tested under conditions similar to those described above.

The statistical concepts employed in the handling of data in this study were not of a complicated order and followed lines widely used and generally understood in experimental research. Statistical comparisons of significance were made in terms of means, standard deviations, standard errors, and critical ratios. In this study a critical ratio (CR) of 3.0 was accepted as an arbitrary level of significant difference. Given a CR of this magnitude, the chances that the difference in means is due to errors of random sampling are less than three in 1000.

Results

An analysis of the data obtained with the various adjustments of the test hearing aid gave the following results:

1. A classification of the type of hearing loss represented by the subjects, modified from Carhart's classification (*1*), showed 33 subjects belonging to the 'G' (gentle downward slope) group, 21 subjects in the 'F' (flat response) group, 20 in the 'M' (marked downward slope) group, 15 in the 'R' (rising curve) group, and 16 in the 'T' (trough-shaped) group.

2. When hearing loss for pure tones was compared by categories of hearing loss, no significant differences existed among hearing loss groups in the frequency ranges from 250-1000 c.p.s., and 1000-2000 c.p.s. Significant differences in the frequency range 2000-4000 c.p.s. were shown when the 'M' group was compared to the 'G' (CR 4.3), the 'T' (CR 4.8), the 'F' (CR 5.1), and the 'R' (CR 7.3) groups. A CR of 3.4 resulted when the 'G' and 'R' groups were compared.

3. Insofar as the principle of complementing or 'mirroring' the audiogram could be followed with the experimental hearing aid, no significant differences were found in the results obtained by selective amplification and by flat amplification.

4. No consistent relationship could be demonstrated between the tolerance range found for the unaided ears and the amount of gain obtained with the hearing aid.

5. In the subjective judgment of subjects as to the type of amplification preferred, approximately equal numbers chose the flat and moderate high-pass patterns, while a significantly smaller number chose the high-pass pattern.

6. No significant differences were found to exist when speech reception threshold gains for the three response settings of the test hearing aid were compared, or when their gains were compared with the thresholds given by the subjects' own hearing instruments.

7. Statistically significant differ-

ences existed among the three response settings of the test hearing aid when the total scores for PB words were considered. Table 1 gives the mean test scores for the three settings. These scores are broken down to include the five different categories of hard of hearing subjects. In addition, the test results for the subject's own instrument are listed for comparison. In Table 2 special attention is given to the total PB scores which appeared in the previous table. Different settings of the test hearing aid are compared with the use of the formula for the critical ratio. The mean scores for the flat response setting and the moderate high pass setting were closely similar (58.8 and 58.2 per cent). The flat response setting gave significantly higher scores than did the subjects' own instruments (CR 3.5). The flat response setting gave significantly higher scores than did the high-pass setting (CR 3.4). The moderate high-pass setting scores excelled the subjects' own hearing aids (CR 2.95), and the scores achieved by the high-pass emphasis setting (CR 2.90).

8. When the accumulated equal-loudness contours for 61 subjects were compared with corresponding unaided pure-tone thresholds, the two measures paralleled each other closely except for a tendency to converge in the higher frequencies. With the subjects whose hearing loss showed a marked downward slope, the equal-loudness contour is much flatter than the pure-tone threshold.

Conclusions

The results of the PB tests seem to indicate that there is little justification for the use of selective amplification in fitting most hard of hearing persons with electronic aids. No serious disadvantage was found, however, in following the principle of complementation on persons with downward sloping audiograms.

If the audiogram is used as the primary basis for hearing aid selection, there appears to be some advantage in seeking additional fitting information from the equal-loudness contour. This is particularly true of persons whose whose hearing loss is characterized by sharp downward slopes in the higher frequencies.

Of greatest significance among the findings of this study are the results achieved with the three response patterns of the test hearing aid when the subjects listened to the Harvard phonetically balanced (PB) words. Emphasis is placed upon PB test results because of its discriminatory sensitivity. The findings are in general agree-

Table 1. Mean percentage PB scores for speech intelligibility tests. (G, gentle downward slope; F, flat response; M, marked downward slope; R, rising curve; T, trough-shaped curve.)

Hearing Aid Setting	*Hearing Loss Classification*											
	G (33)		*M (20)*		*F (21)*		*R (15)*		*T (16)*		*Total (105)*	
	M	σ_M	M	σ_M	M	σ_M	M	σ_M	M	σ_M	M	σ_M
Flat	58.6	2.70	53.5	3.04	62.6	2.60	62.3	4.16	57.5	4.46	58.8	1.50
Mod. High Pass	62.1	3.35	55.5	3.00	59.2	2.61	57.3	4.37	52.5	5.02	58.2	1.62
High Pass	53.8	2.60	49.0	3.32	52.6	3.68	52.3	4.76	46.2	4.75	51.2	1.64
Own Aid	53.4	2.85	46.5	3.35	54.0	3.43	50.3	4.31	48.8	4.50	51.2	1.63

TABLE 2. Critical ratios for speech intelligibility (PB) test results.

Hearing Aid Settings Compared	M	σ_M	M	σ_M	CR
Flat vs. Own Aid	58.8	1.50	51.2	1.63	3.5
Flat vs. High Pass	58.8	1.50	51.2	1.64	3.4
Mod. High Pass vs. Own Aid	58.2	1.62	51.2	1.63	2.95
Mod. High Pass vs. High Pass	58.2	1.62	51.2	1.64	2.90

ment with those of the Harvard research group using eighteen subjects. Best results in speech comprehension were achieved with the commercial instrument when it was adjusted to give an essentially flat response or a moderate high-pass emphasis. The differences in mean test scores were shown to be significantly higher than those given by the high-pass setting.

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Book Reviews

ANDERSON, JOHN E., *The Psychology of Development and Personal Adjustment.* New York: Henry Holt Co., 1949. Pp. 720.

This book contains a well-rounded treatment of the area of developmental psychology for the beginning student. The author brings wide experience and maturity of thought to the writing which is done in an easy flowing style without too much technical language or discursive theorizing. It very adequately attains the purposes for which it was written. These are to provide 'a straightforward and rather simple account of human development, followed by discussion of the processes of adjustment with further discussion of the general principles involved in vocational and marriage adjustment, which are critical adjustments in the life cycle.'

There are 25 chapters organized under seven headings: Equipment for living, Learning skills, Development of language and symbolic skill, Social behavior, Adjustment, Orientation to adult life, and Adjustment to family life. At the beginning of each section, a foreword introduces the scope and general purpose of that section. It is obvious that with the recent tremendous expansion of the science of psychology these seven headings represent a selection, but for the beginning student, the slant toward the developmental and adjustmental points of view imposes a framework within which the material selected is quite representative.

It is obviously impossible to review each of the twenty-five chapters, but several of them will be sampled to present something of the quality of the book.

The introductory chapter is concerned with the question, 'Why study human adjustment?' and outlines in simple terms the scientific approach in understanding both ourselves and others. It emphasizes the fact that the complex organization of a given personality precludes any simple explanation. The 'single' and 'multiple' causation viewpoints of human behavior are contrasted and the fallacy of the single cause explanation is illustrated by Cyril Burt's study of the factors producing delinquency. Burt found that in the background of non-delinquent children there were present, on the average, three unfavorable factors out of the 50 or more studied. For the delinquent children there were, on the average, nine such unfavorable factors present in their background. With the single cause interpretations of Freud and of Marx rampant in present-day thinking, this is a salutary approach to the problem of the complexity of human behavior. The rest of the chapter expounds further aspects of the scientific approach to the complexity of the study of personality.

The section on learning skills includes chapters on how skills are acquired, development of sensori-motor skills, the development of language and symbolic skill, problem-solving and thinking, and intelligence. The chapter on the development of language and symbolic skill particularly is well done. The role of the symbol is lucidly handled, speech as a primary means of social communication and control is discussed, the development of the vocabulary and the sentence is described, and the functions in life which language fulfills are treated from the viewpoint of Piaget.

A chapter on intelligence, after first discussing the nature of intelligence tests, the distribution of intelligence, and other conventional matters, presents the case for and against the inheritance of mental ability. The treatment is objective and on a level comprehensible to the beginning student.

The discussion of motivation is based upon the concept of man as an energy system, or as a combination of energy systems. 'The human being is an energy system or a center of intake and outgo in which food substances are converted into action. Food comes in and energy goes out in a continuous stream . . . . If we assume activity as a basic characteristic of a living organism, as the way life manifests itself, then there is less concern with energy manifestation and much more concern with its direction and organization . . . . from the practical point of view of handling children, this assumption has very important implications, for energy display is then accepted as natural and patience is shown in discovering ways of using it.' This approach is then followed by discussions of the specific emotions considered as energy systems. Lewin's concepts are introduced, and a commendable clarification of that terminology is achieved.

After considering the problems involved in the category of social behavior and per-

Book Reviews is edited by Ernest H. Henrikson, University of Minnesota.

sonality, the author devotes the remaining sections to problems of adjustment. Here a wealth of material is carefully organized. Some of the chapters include adjustment to college, to a vocation, to family life and marriage. There are also discussions of inadequate adjustment and maturity and old age.

Finally, an epilogue entitled 'Two Worlds' considers the general problem of the relation of the individual and society. Each person lives in 'the world of himself in which he meets personal problems and adjusts to situations that arise in his presence with immediate urgency. The other is the world of society, which is about and around him. Two roads are open for improving relations within these worlds: a direct one leading to modification of the person's own behavior, and an indirect one which leads to changes in the atmosphere and relations with society. Two philosophies of living compete for his attention and effort: one, that of improvement from within, and the other, that of improvement from without.'

This volume is a wholesome piece of writing. One may disagree with certain statements or object to some interpretations, but the over-all result is excellent. It very adequately achieves the purpose of introducing the beginning college student to the problems of development and adjustment.

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ARNOLD, GOTTFRIED EDUARD, *Die traumatischen und konstitutionellen Störungen der Stimme und Sprache* (Traumatic and Constitutional Disorders of Voice and Speech). Vienna: Verlag Urban und Schwarzenberg, 1948. Pp. 254.

The first post-war book of European origin to be reviewed by this journal is this German-language volume by Arnold which gives an interesting picture of speech corrective procedures and findings growing out of World War II. As might be expected, Dr. Arnold draws primarily from German military casualties for his case material. The author, who formerly served as director of the section for speech and voice disturbances at the Vienna Ear, Nose and Throat Clinic, collected his data during the years 1939 through 1945. During this period 1250 patients exhibiting disorders of speech and/or voice were examined and treated. Writing on the basis of knowledge gained from this experience, as well as that of previous writers, Arnold describes the different types of pathology represented and something of therapy afforded patients.

Consideration is first given the over-all picture of the clinical cases handled as reflected by tables showing cases handled yearly and results of therapy. Also, before proceeding to the description of specific disorders, the author sets out the components of normal voice and speech production, and describes some of the clinical instruments used in treatment. In the latter category he mentions the Flatau 'Endoskop' for laryngoscopic examination with the mouth closed, as well as wire appliances used in bringing about a proper tongue placement in cases of sigmatism. Several instruments used in providing electrical stimulation to the larynx are also described.

In the section of the book devoted to disorders of voice, Dr. Arnold first gives rather detailed attention to organic disturbances brought about largely as a result of damage by bullets or grenade splinters. The various types of lesions are described together with their effect upon vocalization. The data are made more meaningful to the reader by the frequent inclusion of case histories which give information concerning the diagnosis, the course of therapy, and the prognosis. In treating voice conditions, the author places considerable stress upon organized drills to improve tone quality, pitch variation, and duration of vocalization. Linked with the drills were other corrective procedures such as diathermy, ultra-violet and infra-red ray treatments, and electrical stimulation of the larynx. Arnold emphasizes the point, however, that employment of such technical equipment is only of value when used in conjunction with appropriate vocal exercises. The author reports that this type of treatment generally gave very good results, and that with sufficient practice, an easily audible voice may be attained almost without exception. A tabular representation of 56 voice cases is given, showing type of lesion, condition of the larynx and voice on arrival, and the nature of the voice upon release from the clinic. The author reports that although in most cases the rehabilitation is satisfactory for all usual vocal needs, the patients treated seldom were able to engage in such strenuous activities as shouting, giving loud commands, or singing. This higher grade of performance was achieved only in the more favorable cases exhibiting minor injury.

An interesting section under organic disorders of voice was devoted to the symptoms observable when the vagus nerve was injured or severed at its various levels. The author distinguishes four levels of involvement of the vagus; namely, the segment cranial to the ganglion modosum, the ganglion modosum, the pharyngeal segment including the superior laryngeal branch, and the lower segment including the recurrent laryngeal branch. As in other sections of the book, descriptive case his-

tories are given to illustrate the type of damage under discussion. Attention is further given to the different stages of paralysis in cases of severance of the recurrent laryngeal nerve. Contrary to general opinion, Arnold feels that a surprising measure of vocal rehabilitation may be achieved in cases of this type. Although a normal voice is seldom realized, serviceable vocalization is a goal toward which many patients may look.

The author includes in his discussion of vocal disorders, a most interesting description of the use of paraffin in the case of unilateral paralysis of the vocal bands. In patients where such a technique is indicated, the Bruning apparatus is used to inject a small amount of warm paraffin into the body of the paralyzed vocal fold so that it is maintained in a state of constant adduction. This allows the healthy vocal fold to articulate and bring about a closure of the glottis. After post-operative swelling has been reduced the improvement in vocalization is reported to be 'surprising.' Arnold reports on 20 cases wherein this technique was used with marked improvement observable in all instances. There appeared to be no absorption of the paraffin by the body tissues except in cases where material possessing a melting point of less than 42 degrees Centigrade was used. Certain patients showing progressive atrophy of the paralyzed vocal fold, however, sometimes required further injection.

The treatment given patients with functional vocal disturbances did not vary to any great degree from that used in this country. The author notes, however, that therapy varies from intense shock treatment to mild suggestive approaches, depending upon the physician. Arnold himself favors the more moderate approach to the problem and therefore uses suggestion, vocal exercises, massage, and electric vibrations, most of which are administered by a speech clinician. He found that results are obtained more slowly and with less permanence in the case of military patients than with civilians, the difference apparently being due to the tensions arising from the war situation.

The second portion of the book is given over to disorders of speech as differentiated from vocal disturbances. Again the case material is primarily military, and attention is given to speech abnormalities brought about by damage to the jaws, teeth, tongue, lips, soft and hard palates, and nose. Also under the category of speech disturbances are the aphasias. In this regard it is interesting to note that some discussion is given over to 'aphasic stuttering.' In talking about aphasia the author is quick to recognize the advances made in the United States in this area and frequently cites American authors.

Under the heading of 'Functional Speech Disorders' the author talks of hysterias with speech manifestations, all of which have grown out of the wartime situation and which are to be found among the personnel of all armies. As might be expected, psychotherapy was used almost exclusively with this type of patient. In this same section, stuttering is discussed at some length, the author again paying tribute to the vast amount of work carried out in America in recent years. Patients exhibiting stuttering symptoms were given treatment involving drills to improve coordination of respiration, phonation and articulation, as well as psychotherapy.

In attempting to place an honest evaluation upon this book from the point of view of the speech correctionist, the writer is at once impressed with the fact that a great deal of careful observation has gone into its preparation. The findings would not appear to be startling in nature, either as to data cited or techniques of therapy used. The wealth of speech and voice disorders resulting as a by-product of war injuries, however, and their careful description and evaluation in terms of corrective procedures, should serve as a valuable measuring-stick for similar but less frequently occuring civilian deviations. For the speech pathologist conversant with the German tongue, this book would serve as significant reference work.

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FIELDS, VICTOR A. and BENDER, JAMES F. *Voice and Diction.* New York: Macmillan Co., 1949. Pp. 368.

To quote the authors, this 'book is designed as a reference manual and a text.' The emphasis is on drill material rather than on theory, but the theory that is presented appears to be sound. The style and language seem to the reviewer to be pointed definitely to the student's level. The reviewer would wish that the layout were somewhat different, for the exercises and explanations are in the same size print and with the same type of headings. This might make the book less usable as a reference manual.

The book is developed along the line that at first there should be no time for 'interpreting the thought content of practice passages but demands instead strict attention to the mechanics of articulation, pronunciation, etc., until correct habits are initiated. As the student advances, oral reading and extemporaneous techniques may be practiced to provide a carry over from his daily practice to conversational speech.'

In the opening chapter, the authors pre-

sent sufficient background of the functioning of the speech-vocal mechanism and laws of habit formation to make the later exercises understandable. Great emphasis is placed throughout the book on development of aural consciousness on the part of the student.

In the chapter, *Breathing,* the authors approach the process as it relates to speech from both the psychological and the physiological standpoints. Breathing is a 'vital function of living and may not be fundamentally disturbed or antagonized by singing or speaking processes. Psychologically, the correction of bad breathing habits is an "inside job" to be approached indirectly by implanting in the speaker's mind correct attitudes and feelings which will stimulate buoyancy, intense interest and wholehearted, enthusiastic expression. Physiologically, the strengthening of the muscles that support breathing may be accomplished as an independent physical exercise to improve posture and relaxation and thus improve the breathing function.'

In the chapter, *Voice,* 'the student's chief concern is not how to control but rather how to free his voice so that it will function spontaneously in response to his hearing reactions and emotional impulses.' Emphasis is on controlling rate during preliminary stages of speech training. Exercises on syllabic rate control are numerous.

The next two chapters are titled *Consonants* and *Vowels,* respectively. In the first chapter there are tables illustrating how consonants are broken down according to position, sonancy, and duration. The consonants are not classified according to oral and nasal emission. Symbols of the International Phonetic Alphabet are always given in brackets. The reviewer questioned the expediency of presenting the consonants according to position, sonancy, and duration and then presenting the exercises for the various consonants in alphabetical order. This latter is not true for the exercises for the vowels, which are presented from the point of view of position. The exercises for the consonants and vowels are excellent.

The later chapters devoted to ear training, pronunciation, and oral reading are extremely interesting. The authors use phonetics as a method of ear training and precede such training with exercises for increasing hearing radius, for differentiating noises, and for increasing auditory memory span. Many opportunities are created for developing phonetic skill with early sentences written half in 'eye words' and half in 'ear words.' The exercises in oral reading create opportunities for the student to put together all of the techniques learned in the preceding chapters.

The book concludes with an index for all corrective exercises given. Teachers of speech improvement classes should find this new book of value in their work.

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MORGAN, JOHN J. B. *How To Keep A Sound Mind.* New York: MacMillan Co., 1946. Pp. 394.

This volume is a revision of *Keeping a Sound Mind* which was originally published in 1934.

The point of view which underlies the content of this book is that mental health is dependent in large part upon the formation of mental habits and the elimination of certain others. The author believes that it is just about as easy to form the beneficial habits as it is to fall victim to detrimental habits if the person involved can be given a clear conception of their importance. Furthermore, 'it is believed that the practice of these habits which bring mental health is just as enjoyable, or more so, than the practice of the pernicious mental habits which lead to mental disease. It is ignorance which does the damage.'

The reader is helped to understand the influence of parents and teachers in the formation of these habits during infancy and childhood. He is given to understand that as an adult he must direct his mental development primarily by himself.

Although the volume is especially intended for college students and veterans it is written sufficiently simply for many adults at large. It should meet the needs for basic mental hygiene of many adults with speech and hearing problems. The author has succeeded in presenting many essential principles which have come out of a great amount of work by specialists in mental disorders without their abstract terminology.

Of special value for persons with speech and hearing disorders are the chapters on How to Attain Social Security, How To Overcome Handicaps, How To Master Your Fears, How To Overcome Emotional Depressions, How To Solve Mental Conflicts, and How To Be Happily Maladjusted.

While the author succeeded in presenting his material with clarity and simplicity he does not oversimplify this most complex subject. He leaves the impression at all times that there must be balance; he consistently points out the paradoxes of human nature and warns against the permitting of any apparently successful adjustments being carried too far. At the same time he helps persons to take advantage of their mistakes and maladjustments in constructive solutions.

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PORTEUS, STANLEY D. *The Practice of Clinical Psychology*. New York: American Book Co., 1941. Pp. 579.

Dr. Porteus, who is director of the Psychological Clinic at the University of Hawaii, has written in the foreword that 'the book represents, in the main, one man's experience but not one man's work.' And he has had wide experience in the clinical field since he received his D. Sc. from Melbourne in 1912; he has worked in Australia, at the New Jersey Training School in the United States, as well as in Hawaii.

There is a great deal in this book that is of value to practicing clinicians, particularly those concerned with children. Porteus says that 'the psychological clinic deals chiefly with juvenile cases,' and most of the clinical cases cited as examples are drawn from the childhood and adolescent age groups. There are no chapters devoted specifically to the adult, which limits the book's usefulness to those interested in this clinical area. Four chapters deal with the child: The Feeble-Minded Child, Abnormal Children, Examination of Young Children, and The Dull and Backward Child.

It is of interest to find that criminality, which is too often slighted in books on clinical psychology, receives adequate treatment: Predisposing Conditions in Delinquency, Delinquent Personality and Treatment, and The Criminal.

The speech pathologist may find helpful material in Chapter 17, Diagnosis of Reading Disabilities, which was contributed by Dr. Colin J. Herrick who is assistant director at the University of Hawaii Clinic. Stuttering is briefly discussed in six pages in Chapter 11, Some Specific Clinical Problems. None of the other speech disorders or hearing problems is specifically mentioned.

There is a tendency on reading this book to feel that it is 'dated,' and it is true that there have been many advances in psychological testing and therapeutic techniques in the eight years since its publication. But the topics dealt with in The Role of the Clinical Psychologist, Survey of Clinical Problems and Methods, and Clinical Services and Relationships, are just as pertinent today as when they were written. Porteus' remarks about the psychiatrists, however, are now somewhat out of place in view of the excellent relationship established in most clinics between the medical and psychological professions. To use his own phrase, he is 'shooting a dead crow' when he expounds on the rivalries and enmities between the two groups.

As a reference book on psychometrics, the value of this volume is distinctly limited because of the recent and tremendous emphasis on personality testing and developments in factor analysis and other statistical treatments of psychometric results. This is no fault of Porteus whose treatment of the Stanford Binet and some of the older performance tests contains helpful suggestions for the clinician. Incidentally, the Porteus Maze Tests, which were first published in 1915, receive only moderate emphasis, perhaps due to the author's modesty. In the reviewer's opinion, the Maze tests are of much use in a wide variety of clinic cases and they have not received the attention that they deserve.

The Rorschach Test is given nine pages contributed by Dr. Mary Hunter in Chapter 8, Special Supplementary Tests. It seems strange to find that the phrase 'projective methods' which is currently so much in vogue does not appear in Porteus' text until we realize that it was first used by L. K. Frank only two years before in 1939.

Psychoanalysis is discussed in Chapter 18 and is probably adequate for a book of this nature.

The Practice of Clinical Psychology has a limited usefulness for clinicians working in the field of child and adolescent psychology and they may wish to add this to their libraries. Anyone wanting a complete survey of the present status of clinical psychology will do better to investigate one of the many recent books on the subject.

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Abstracts

SMITHSON, D. and DUNN, H. M. Summer means speech. *Crippled Child*, 1949, 27 (1), 4-6.

The authors discuss the organization and functioning of a summer residence school for a selected group of Vermont children with speech and hearing disorders. Problems considered are selection of cases, housing facilities, maintenance and operation, parent participation, costs, student clinicians, and recreation. The second part of the article is to appear in the next issue. (*K.S.W.*)

SMALTZ, J. M. Mobile speech and hearing clinic in North Dakota. *Hearing News*, 1949, 17, 3, 10-13.

The organization and functioning of a testing program employing a trailer is described. Two clinicians found approximately 7% of the children examined required speech correction, and 6% were referred to physicians because of hearing loss in varying degree. (*L.G.D.*)

ALCORN, S. Speech in the Detroit day school. *Volta Rev.*, 1949, 51, 163, 192-194.

The speech program in a day school is depicted, with emphasis on vibration as a stimulant for speech. A group hearing aid is used only if there is some response. If speech is to be used as a tool, then the entire speech program from pre-school through the grades must be integrated. (*L.G.D.*)

RONNEI, E. C. Parents and hearing handicapped children. *Hearing News*, 1949, 17, 1, 18-22.

Parents have obligations to their aurally handicapped children, and the audiologist can assist them in the task of coping with the problem. The parent must understand his feelings toward the child, not press for perfection in performance, learn the facts about the hearing loss and communicate them to the rest of the family, and secure the best possible in rehabilitative measures. (*L.G.D.*)

AMOS, M. L. and ROBLEE, D. B. The rehabilitation of persons with impaired hearing. *Hearing News*, 1949, 17, 3, 9-10.

This second of two articles continues a listing of subjects to be included in a complete audiologic report. Items covered include speech and voice, vision, hearing aid data, restorative education and environmental factors. (*L.G.D.*)

HEDGECOCK, L. D. and FITCH, W. J. When your client needs a hearing aid. *J. Rehabilit.*, 1949, 15 (1), 25-29.

The authors discuss the hazards of sending the deafened person to a number of hearing aid dealers to select the most suitable instrument. The vocational rehabilitation representative is advised to send such clients to the nearest hearing clinic and to an otologist for adequate examinations and follow-up services. These are discussed briefly.

Eight points are presented as a buyer's guide in the selection of a hearing aid and a number of references cited for supplementary reading. (*K.S.W.*)

SILVERMAN, S. R. Recent developments in hearing aids. *J. except. Child.*, 1949, 15, 235-238, 255.

Despite advances in the medical and surgical treatment of deafness, hearing aids have the widest application in helping those with impaired hearing. The physical characteristics of hearing aids have improved in the last decade as a result of effective government, academic, and commercial research. Reduction in size and weight and improved performance in acoustic gain, frequency response, tone control, and reduction of intrinsic noise have increased consumer acceptance of hearing aids.

The initial and operating costs are still a problem to many hard-of-hearing people. Although tests for the selection of hearing aids have limitations, they are exceedingly helpful to prospective users. Auditory training is suggested for all hearing aid

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Abstracts is edited by Eugene T. McDonald, Pennsylvania State College, assisted by the following committee: Jack L. Bangs, University of Washington; Leo G. Doerfler, University of Pittsburgh; Charles R. Elliott, Pennsylvania State College; William G. Hardy, Johns Hopkins University; Harry S. Wise, U. S. Marine Hospital, Boston, Mass.; and Kenneth Scott Wood, University of Oregon. The committee systematically reviews 152 journals for articles of interest to members of ASHA. Students and other members are encouraged to submit abstracts. Directions for preparing abstracts may be obtained from the abstracts editor.

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users. A selected bibliography is given. (*K.S.W.*)

SCHNECK, J. M. Audiometry under hypnosis. *Psychosom. Med.*, 1948, 10, 361-365.

The author reports of the use of audiograms obtained under hypnosis as a basis of determining more extra thresholds for pure tones in subjects with psychological factors involved in their hearing disability or with other test and clinical results inconsistant with their decibel loss. Audiograms recorded in waking and trance states are given for six subjects. A case, showing marked discrepancies in his audiograms, is discussed at length to illustrate the usefulness of this technique in such an instance of conversion hysteria. (*C.R.E.*)

NELSON, M. S. The evolutionary process of methods of teaching language to the deaf with a survey of the methods now employed. *Amer. Ann. Deaf.*, 1949, 94, 230-294.

This thesis from Gallaudet College recounts in some detail the multitudinous methods which have been advanced for teaching language to the deaf, ranging from de L'Epee through Hill, Peet, Bell, Wing's Symbols, the Slates and the Key to the Lexington or Natural Method. Textbooks written for the deaf are listed. 'All of these various methods, stemming from others, or original in themselves, have been valuable contributions to the field of education of the deaf, as they have paved the way for modern methods and philosophy.' (*L.G.D.*)

BECKER, V. A. The sign language of the deaf. *J. Rehabilit.*, 1949, 15 (2), 21-23.

The author discusses the history of sign language for the deaf and describes finger spelling as well as some of the word signs. Facial expressions as used among the deaf are discussed. (*K.S.W.*)

JOHNSON, L. F. and SILVA, H. Present day status of fenestration surgery. *N. Engl. J. Med.*, 1949, 240, 718-721.

This is a summary of 18 years of experience in fenestration surgery at Boston University School of Medicine and Massachusetts Memorial Hospital. These authors feel that only the Lempert operation has restored practical hearing in otosclerosis. They show that only one in 100 will develop increased deafness as a result of the operation and they believe that with improved techniques still better results will obtain. (*H.S.W.*)

GROVE, W. E. Will noise damage one's hearing? *J. Amer. med. Ass.*, 1949, 140, 674-677.

The writer discusses in detail the most recent findings of the several members of the Committee on Conservation of Hearing of the Academy of Ophthamalogy and Otolaryngology. The article is divided into five major sections: (1) sources and intensity of injurious noises, (2) nature of the hearing defect, (3) method of procedure (of the sub-committee on industrial noises), (4) preventive measures, (5) medical legal aspects (of industrial noise and deafness).

These data and bibliography give the speech correctionist specific and detailed information on the areas of expected hearing deficiencies in the adult, and the legal responsibilities of the worker and the employer, as well as the practitioner and the correctionist. (*H.S.W.*)

MACKLIN, M. T. The importance of heredity in causing congenital deafness. *Hygeia*, 1949, 27, 538-539, 574-575.

The author writes, in popular style, on deafness and diseases of childhood, and concludes the article with a short report of a study of the causes of deafness in 305 families. The results of the study indicate that a considerable percentage of cases of congenital deafness are hereditary in nature. (*J.L.B.*)

HIRSH, I. J. Binaural summation—a century of investigation. *Psychol. Bull.*, 1948, 45, 193-206.

A summary of binaural summation studies is given. Critical evaluation is by selection of studies more than in the text comment. There are 36 references. (C.R.E.)

WEAVER, E. G. and LAWRENCE, M. The patterns of response in the cochlea. *J. acoust. Soc. Amer.*, 1949, 21, 127-134.

The intensity function for the cochlear potential of the guinea pig was determined to the apparent maxima; the stimuli selected were pure tones ranging from 100 to 15,000 cycles. Small stimulus increments were employed, with especial care taken beyond the linear section of the response function.

Both the limits of linearity and the peak values obtained gave flat curves to approximately 1,000 cycles, the former somewhat below 400 microvolts and the latter at about 1,000 microvolts, as measured by a GR 736-A wave analyzer. Beyond this point both values decreased steadily. Cochlear response patterns are diagrammed in terms of location on the basilar membrane for varying magnitudes of stimulation. Stimulation at very high intensities reveals the presence of a form of cochlear reserve. (*L.G.D.*)

LUSCHER, E. and ZWISLOCKI, J. Adaptation of the ear to sound stimuli. *J. acoust. Soc. Amer.*, 1949, 21, 135-139.

The auditory threshold is raised by pre-

vious stimulation, such change being termed adaptation. Utilizing a procedure of successive stimulation and measurement of threshold, adaptation reached a maximum in about .4 seconds, with return adaptation being virtually completed in a few tenths of a second. Adapatation was linear when expressed logarithmically versus intensity of stimulus, and raised the threshold of surrounding tones. Adaptation is similar to but not synonymous with masking, and both are peripheral. (*L.G.D.*)

JEFFRESS, L. A. Interaural phase difference and pitch variation: day-to-day changes. *Amer. J. Psychol.*, 1949, 62, 1-19.

Variation of pitch comparisons at two frequencies under four different conditions, on two subjects, over two months, is reported. The data are interpreted to support a previously hypothesized central structure mediating pitch for low frequency tones with binaural stimulation. Another central structure is suggested that would represent frequency in terms of place and still allow for the stimulus-frequency—impulse-frequency relation required for sound localization. (*C.R.E.*)

POLLAK, I. Specification of sound-pressure levels. *Amer. J. Psychol.*, 1949, 62, 412-417.

In psycho-acoustic experiments a variety of terms have developed to express the intensity of auditory stimuli. This is a description of the more important conversion factors that may be used in transferring from one set of measurements to another. A short discussion of cautions to be observed is included. (*C.R.E.*)

JORDAN, W. R. and MERRITT, H. H. Neurology. *N. Engl. J. Med.*, 1947, 240, 217-227.

This is an 11 page summary of 'Medical Progress' in neurology for the past year. The 88 references are classed under the headings: Bio-chemistry; physiology and anatomy; pharmacology; infections, cerebrovascular system; convulsive disorders; myasthenia gravis and familial periodic paralysis; multiple sclerosis; and miscellaneous. Among this tremendous amount of experimental data are many items applicable to speech problems. (*H.S.W.*)

ROSENBAUM, H. and RENSHAW, B. Descending respiratory pathways in the cervical spinal cord. *Amer. J. Physiol.*, 1949, 157, 468-476.

Hemisected cats and rabbits were studied for data on the functional importance of crossed innervation of the hemidiaphraghm. The authors conclude that bulbo-spinal fibers of respiratory function descend on intact side of the cord and make connections with the phrenic motoneurons of the opposite side. These connections are quantitatively less powerful than the uncrossed ones. Intensity of discharge from the respiratory center is an important factor determining whether impulses in the crossing pathways alone will effectively excite the phrenic motoneurons. (*C.R.E.*)

GREENBLATT, M. and MYERSON, P. G. Psychosurgery. *N. Engl. J. Med.*, 1949, 240, 1006-1017.

This is an article dealing with the recent medical progress in psychosurgery. It deals with a short historical sketch on the subject; it describes with great clearness the types of procedures: (a) bilateral lobectomy, (b) unilateral lobectomy, (c) bilateral orbital leukotomy, (d) frontal lobectomy (unilateral and bilateral), (e) transorbital lobectomy (bilateral), (f) topectomy (bilateral), (g) thalamotomy (bilateral), (h) cortical undercutting (bilateral) and (i) bilateral medial lobotomy. The authors give a short survey of the anatomic and theoretic considerations involved in these operations, the indications and results, the complications and summarize the studies and effects in rehabilitation. They list 167 references.

This article, while not directly dealing with speech or hearing, actually is an important source of reference material for the speech clinician who works in the hospital or institutional area. (*H.S.W.*)

DIEFENBACH, W. C. L. Left vocal cord paralysis associated with hypertensive heart disease. *Med. Prog.*, 1949, 240, 419-420.

Two cases are reviewed. (*H.S.W.*)

THOMA, K. Oral surgery. *Med. Prog.*, 1949, 240, 18-19.

This is a summary of recent advances in oral surgery. While this article is not directly in the field of speech correction, it deals with the techniques and methods which will be encountered by the speech therapist who works with the dental surgeon and orthodontist. (*H.S.W.*)

GRABER, T. M. Craniofacial morphology in cleft palate and cleft lip deformities. *J. Surg. Gynecol. Obstet.*, 1949, 88, 359-369.

This is a preliminary article of a series which attempts to answer, in part, the following in order to establish criteria by which the surgeon may estimate his chances of success or failure in repair of facial defects:

(1) Why do we see wide variations in facial appearance among the cleft palate groups? (2) Are the ultimate results different for different surgical techniques and

timing? (3) Can fibrous bands of scar tissue, resulting from soft tissue repair, hold back growth and development? (4) What is the development pattern in patients operated upon versus that in those not operated upon? By means of anthropometric evaluation of 45 cleft palate patients, these questions are partially answered. (H.S.W.)

LENNOX, W. G., MCBRIDE, M. and POTTER, G. Who cares for the epileptic? *N. Engl. J. Med.*, 1948, 238, 215-218.

The authors sent questionnaires to all members of the Massachusetts Medical Society, requesting information on how many epileptics had been seen by the doctor in office and clinic during the present year. Two thousand seven hundred ninety-six doctors replied and of this number 58% had treated patients in that time. Of these doctors, 71% saw them in the office, 19 in clinics and 10% in both places. Of the 11,434 patients treated, 40% were seen in clinics and 60% in offices. Each doctor, on the average, treated 4.1 patients. From this survey it was established that only one-half of the epileptics in the state were receiving treatment or even supervision. (*H.S.W.*)

HEILMAN, A. E. Appraisal of abilities of the cerebral palsied child. *Amer. J. ment.* Def., 1949, 53, 606-609.

Problems involved in evaluating the abilities of cerebral palsied children are discussed. Seven references are given. (*C.R.E.*)

HATCHER, C. C. Athetoids relax and speak. *Crippled Child*, 1949, 27 (1), 14-16.

A program of relaxation to reduce tension in athetoid cerebral palsy cases must be integrated with speech therapy. The personal relationship between the therapist and the patient is extremely important in the achievement of relaxation. Speech therapy *per se* is not likely to be needed with the average athetoid. The therapist needs to be able to deal with such problems as over-protection, non-acceptance, insecurity, and improvised communication systems rather than with the teaching of proper lip and tongue movement or other mechanism performance. A number of specific suggestions are given for combining speech training and relaxation work. (*K.S.W.*)

KROUT, M. H. Is the brain-injured a mental defective? *Amer. J. ment. Def.*, 1949, 54, 81-86.

A discussion of the procedures employed by the clinical psychologist to determine the 'global intelligence' of the brain injured, the presence or absence of organic brain involvement, the character of the disturbance in brain dynamics, and the other related factors assessed in the brain injured person is presented to answer the author's question posed in the title of his article. (*C.R.E.*)

WEINER, B. B. A classroom achievement inventory for young mentally retarded boys. *Amer. J. ment. Def.*, 1949, 53, 460-465.

The Classroom Achievement Inventory is described. It consists of 80 items arranged under eight areas of activity as follows: visual matching, sight recognition and naming, verbal production, responses to music and literature, non-verbal production, thinking processes, following verbal directions, range of information. Developed from direct observation of children of mental age 3.10 to 5.11, it is proposed as an aid to discovering and utilizing the assets and observing the progress of young mentally retarded children with mental ages below six years. (C.R.E.)

SHANDS, A. R. Diagnostic clinic for rehabilitation. *J. Amer. med. Ass.*, 1949, 140, 937-940.

This article charts and discusses the organization of a rehabilitation and diagnostic clinic for personnel in industry. The clinic as it is outlined might well be transferred in its entirety to the university situation. In this scheme the speech pathologist would be an integral part. (*H.S.W.*)

A coordinated research program in psychotherapy. *J. consult. Psychol.*, 1949, 13, 149-220.

This entire issue is given over to the presentation of seven separate research studies in psychotherapy utilizing the same basic data from 10 completely recorded and transcribed cases with pre- and post-tests. An introduction by Carl Rogers, director of the studies, and a description of the 'parallel studies' project is included. The papers concern the following topics: The process of nondirective therapy, the relationship between acceptance of self and acceptance of others, the self concept and feelings toward others, defensive behaviour in client-centered therapy, reported behaviour changes in counseling, evaluation of nine psychotherapy cases by the Rorschach, analysis of six parallel studies of the therapeutic process. (C.R.E.)

ORLANSKY, H. Infant care and personality. *Psychol. Bull.*, 1949, 46, 1-48.

This is a critical study of the empirical data supporting the theory that factors in infant care determine personality. A survey of the literature in the areas of nursing experiences, 'mothering,' sphincter training, restraint of motion, and infant

'frustration' and 'aggression' is presented. A discussion of the evidence leads to a largely negative conclusion. The author offers a theory emphasizing constitutional factors, the effect of the total cultural situation on development, and the importance of post-infantile experiences in the shaping of character. (*C.R.E.*)

WYATT, G. L. Stammering and language learning in early childhood. *J. abnorm. soc. Psychol.*, 1949, 44, 75-84.

A review of some existing theories of stuttering is followed by a discussion of the nature of language and the raising of three methodological questions by which the viewpoint is expressed that in our investigation of language development and speech disturbances in children we must keep in mind three dimensions of our problem: the individual, historical learning situation of the individual child, the individual learning capacity of the individual child, the objective difficulties inherent in the object of learning, language itself. (*C.R.E.*)

AMMONS, R. B. and HUTH, R. W. The full-range picture vocabulary test: I. Preliminary scale. *J. Psychol.*, 1949, 28, 51-64.

In clinical practice there is frequent need for a brief test of verbal ability which does not require the testee to express himself verbally. The need is acute in the case of children with retarded speech, physically handicapped persons, and where rapid, valid individual testing is called for. There is not at present a short valid test of verbal ability covering the range from infancy to adulthood which does not call for reading, writing or oral production.

The authors assembled a set of 16 plates each of which contained four pictures. A list of 253 words and phrases was made up, each one applying to only one picture on one plate. There were from 14 to 21 words per plate. The test was administered by reading orally the words or phrases and having the subject point to one of four pictures to which they applied.

This test and the 1937 Stanford-Binet vocabulary test were administered to two boys and two girls at each grade level from kindergarten through the twelfth grade. Analysis was made of the number passing each item at each grade level. A scale of 48 items was selected and the total number of items passed was calculated for each child. Norms are given for various Binet vocabulary mental ages. The odd-even reliability coefficient was found to be .95, and the total scores correlated .96 with Binet vocabulary scores.

The limitations of such a test are pointed out and a program outlined for constructing and standardizing such a scale. (*K.S.W.*)

SMITH, H. E. Measurement of vocabularies of young bilingual children in both of the languages used. *J. genet. Psychol.*, 1949, 74, 305-310.

The subjects were 30 children of Chinese ancestry resident in Honolulu and ranging in age from 37 to 77 months. Vocabulary was measured by the use of the Smith Vocabulary test given in English one day and in Chinese the next day by an examiner conversant with both languages.

The author concludes that in either language this group was found to have below average-sized vocabularies for children of their age and suggests that only the superior bilingual child is capable of attaining the vocabulary norms of the monoglots. She feels it is unwise unnecessarily to start any but children of superior linguistic ability at a second language during the pre-school years. (*J.L.B.*)

EAMES, T. H. Visual and related factors in reading. *Rev. educ. Res.*, 1949, 19, 107-117.

During the past three years, research literature on the relationship of reading to various skills or defects which might influence reading ability has exhibited two marked trends. The first has been to make a more comprehensive search for physiological factors operating as causes of reading progress or failure. The second has been a greater emphasis on physical factors underlying readability.

The author briefly reviews studies in the following fields: Ophthalmologic and optometric comparisons between good and poor readers, the eyes and screening devices, evaluation of vision tests, visual perception in reading, eye movements in reading, lateral dominance and reading, pediatric studies involving reading, visual motor performance and reversals in reading, readability, and effects of illumination.

Forty-six references are given (*K.S.W.*)

BRUSSEL, J. A. Head injury. *Hygeia*, 1949, 27, 620-621, 646-647.

This article discusses symptoms of various types of head injuries in adults and children and offers suggestions for emergency care. The author emphasizes the fact that there may be physiological and psychological symptoms in cases of head injury and that under no circumstances should a person suffering a head injury be moved or allowed to move himself until examined by a doctor, no matter how slight the wound. (*J.L.B.*)

News and Announcements

Notice

Copies of the March and June, 1944, issues of the *Journal* are needed for the Association archives. Persons who are willing to furnish one or more of these issues should write to the Business Manager, George A. Kopp, Speech Clinic, Wayne University, Detroit, Michigan. The Association will pay for the copies needed and the cost of mailing.

The second International Audiology Conference was held at the Royal Society of Medicine, London, July 15 and 16, 1949 with President Gunnar Holmgren presiding. Representatives from some 20 countries were present. The conference is assuming a more definite organizational character, the exact form of which is yet to be determined. It has been proposed that there be a permanent two-member committee from each country, the members of which will constitute the Council. The Council would then invite specially qualified visitors to the meetings to supplement the delegates from each country. The delegates and visitors would be otologists, psychiatrists, speech experts and others with qualifications and interests in audiology.

The major portion of the two-day session was devoted to scientific papers. E. P. Fowler, Jr., M.D., gave the report of the Standardization Sub-Committee. It was recommended in general that standards already generally accepted by organizations be adopted by the International Audiology Conference. The consensus of opinion, however, was that standards about which there is still marked disagreement, such as calibration of audiometers, should be circulated among interested parties for comment before final official standards are drawn up.

Harvey Fletcher, Ph.D., director of research at Bell Telephone Laboratories, gave a paper developing the thesis that the hearing threshold for speech can be determined accurately from the pure-tone audiogram. Leonard Holmgren, M.D., Stockholm, reported on the activities of the Swedish National Committee under three heads: fenestration surgery, noise and prevention of acoustic trauma, and hearing aids. Representatives from France, Belgium, Argentina and Holland reported on progress being made in audiology.

The papers on the second day were given by English colleagues who have responsibility for operating the government's scheme for rehabilitation of the deafened under the authority of the National Health Act. The success of the program was discussed from many angles. The complete transactions of the Conference will be published in a forthcoming *Acta-Otolaryngologica* supplement.

The American Academy of Ophthalmology and Otolaryngology held its fifty-fourth annual meeting in Chicago the week of October 9. Each year the Conservation of Hearing Committee has a Sunday evening session to which the general public is invited. This year the program was in charge of the Otosclerotic Study Group, and was centered around the problem of conductive deafness.

The first part of the program was a symposium on pure-tone and speech testing with particular reference to selection of cases for fenestration and judging the results of therapy. S. Richard Silverman, Ph.D., St. Louis, gave a paper on the use of speech tests for the evaluation of clinical procedures.

News and Announcements is edited by Miriam D. Pauls, The Johns Hopkins University.

Raymond T. Carhart, Ph.D., Evanston, spoke on the clinical application of bone conduction audiometry. Hallowell Davis, M.D., St. Louis, was the discussant. H. G. Kobrak, M.D., Ph.D., Chicago, presented a paper on the physiology and pathology of the sound conduction system of the ear. Julius Lempert, M.D., New York, talked on the conservation of hearing.

An International Congress for Deaf-Mute Education is being planned for June or July, 1950, to be held at Groningen, Holland, on the occasion of the one hundred sixtieth anniversary of the Royal Institute for Deaf-Mutes. This will be the first such congress since the war. Further particulars will be published when plans are complete.

A new pilot-demonstration program in school-health services has been instituted in Washington County, Maryland, under joint planning and the direct administration of the county departments of health and education. Dr. Perry Prather is Deputy State Health Officer, and Mr. William Brish is Superintendent of Schools. The new program provides not replacement but support for work at the school-health level, centered around the activities of a full-time pediatrician, a pediatric nurse and a nutritionist. Supporting clinical services include: Mental Hygiene, Orthopedics, Pediatrics, Dentistry, Venereal Disease, Tuberculosis, Maternal and Child Care, Hearing Conservation, and Audiology and Speech. The Board of Education has recently added a speech correctionist, and is arranging for a full-time clinical psychologist. Considerable time is being devoted to in-service training of teachers and public health personnel, particularly in Mental Hygiene and Audiology and Speech. A principal objective is the establishment of full diagnostic services keyed to the needs of 'the whole child,' and Washington County is a leader in such joint health-educative projects. The program was established in cooperation with the State Public Health Bureau, Maternal and Child Care and Services for Crippled Children, of which Dr. Edward Davens is Chief. The enabling grant originated with the U. S. Children's Bureau, Federal Security Agency.

The Soroptimist Club of Hartford, Connecticut, is announcing the establishment of a fellowship to provide educational opportunity on the graduate level for a person who has demonstrated his ability in the field of occupational, physical or speech therapy; nursing, social work, medicine or education. The fellowship includes an appropriation of $1,500 to be given for maintenance, tuition, books and other supplies. Applications will be accepted up to January 1, 1950. Information may be had by writing Mrs. Alyce Pullar, 77 Steele Road, West Hartford, Connecticut.

Guidance Workers' Preparation, A Directory of the Guidance Offerings of Colleges and Universities, has been published by the Office of Education, Federal Security Agency, Washington, D. C.

Among the September, 1949, releases by Coronet News Bureau, 65 E. South Water, Chicago, are two films dealing with social adjustment. *Sharing Work at Home* shows the importance of cooperation to happy family life, and is suitable for the Junior High, Senior High, College and Adult levels. *Let's Play Fair* concerns sharing, taking turns, and obeying the rules, and is for the Primary and Intermediate levels. Each film is one reel in length and may be secured through purchase or through film lending libraries.

The National Bureau of Standards, Washington, D. C., has issued a six-page letter circular (LC-945) called 'Suggestions for the Selection of a Hearing Aid.' It contains authoritative

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information on the causes of loss of hearing, sources to which to turn for unbiased information on the choosing of hearing aids as well as the care of the instrument. It is available on request without cost.

The annual convention of the National Society for Crippled Children and Adults, Inc., was held in New York in November. Dr. William Menninger was the luncheon speaker on Cerebral Palsy Day and spoke on emotional adjustment.

The second annual Grinnell College Speech Center, sponsored by the Iowa Society for Crippled Children, was held on the Grinnell Campus for a six-week period this past summer. The program was under the direction of Mrs. Velma B. Hiser, Assistant Professor of Speech. Thelma Knudson, Supervisor of Speech and Hearing Therapy in the South Bend, Indiana schools, was director of speech. Thelma Myers directed the remedial reading program. **Jean McNie, O.T.R.,** teacher of Vocational Homemaking in the St. Ansgar, Iowa schools and formerly an occupational therapist in the U. S. Army, had charge of Occupational Therapy, and Pauline Hunter, Instructor in Physical Education at Grinnell, supervised recreation. Five student speech correctionists, and four assistants in recreation completed the staff. An integrated child development program was carried out through these activities. Emphasis was placed on parental and school cooperation to insure follow-up therapy.

The University of Pittsburgh has established a new Department of Speech which began its work this fall. Buell Whitehill has been appointed head of the new department. Fifty-two courses will be offered by a faculty of 24. One of the greatest responsibilities of the staff will be the organization of the new remedial courses in speech which were approved by the college faculty last year. These remedial courses will be given all freshmen in need of them as determined by speech placement tests.

United Nations Educational, Scientific and Cultural Organization proposes to publish later in the year a Manual on the Inernational Exchange of Publications. It will include a classified list of institutions, including learned societies, which are willing to exchange publications.

The Arlington Public Schools have expanded the speech department this year. Zelda Horner Kosh is the Supervisor of Speech Education. Added to the staff are Mary Elizabeth Peebles, M.A., and John Kiernan, M.A., both of Teachers College, Columbia University. In January, Rose Feilbach, at present Executive Secretary of the Washington Hearing Society, will join the Arlington staff.

At their annual convention the American Association to Promote the Teaching of Speech to the Deaf voted to change the name to the Volta Speech Association for the Deaf. Their headquarters at the Volta Bureau in Washington, D. C., is an information center about deafness. Its library on deafness and speech is one of the largest in the world, containing books in 20 or more languages. The Association was established by Alexander Graham Bell in 1890.

The thirty-eighth annual meeting of the Acoustical Society of America was held in St. Louis on November 17, 18, 19, 1948. Two subjects were emphasized. The first was *Vibration,* which included papers on instrumentation, theoretical aspects, measurements and effects on personnel. The second was *Psychoacoustics,* which dealt with the phenomena of hearing, tests of hearing, and observations on the physiology of hearing in animals and men.

The Memphis Speech and Hearing Center has completed its first year of

operation as an organization providing speech therapy, instruction in speech reading, and oral class for pre-school deaf children, pure-tone and speech audiometry, evaluation of hearing aids, and consultation services for problems of speech and hearing. The Center is sponsored by the Tennessee Society for Crippled Children and Disabled Adults, the Junior League of Memphis, and the University of Tennessee College for Medicine.

The State Department of Education, Florida has published Bulletin No. 55, *Developing a Program for Education of Exceptional Children in Florida.* It is designed to interpret the state law and state regulations and serve as an administrative guide to the special education program. It should be helpful not only to administrators and teachers, but informative to doctors, nurses, social workers, rehabilitation workers, and all others interested in furthering such programs. It is available on request.

Graduate Assistantships

In the last several issues announcement has been made of a new section devoted to information concerning graduate assistantships in speech and hearing disorders and speech science available at various universities. Such notices are included for the first time in this issue. This section will be restricted to part-time appointments only; it will not include full-time positions, scholarship grants, or tuition scholarships.

Directors of units and heads of departments are invited to submit listings to the News and Announcements Editor. Information should include formal titles of position, institution, and unit; dates, general duties, and remuneration; name and address of person receiving applications. Copy will be accepted at any time, but the usual deadline for each issue is two and one-half months prior to the publication date. For the coming March issue, however, announcements will be accepted at the office of the Editor up to January 1.

Research Assistantships. University of Illinois. The Speech Research Laboratory, Department of Speech. Starting February. June, or September, 1950. Half-time; 20 hours per week of laboratory research assistance. $1200 for nine months, or $1465 for eleven months; remission of tuition. Student expected to enroll for three-fourths of normal graduate course load. Address Grant Fairbanks, 321 Illini Hall, University of Illinois, Urbana, Illinois.

Clinical Assistantships. University of Illinois. The Speech Clinic, Department of Speech. Starting February or September, 1950. Half-time: 20 hours per week of clinical assistance. $1200 for nine months; remission of tuition. Student expected to enroll for three-fourths of normal graduate course load. Address Karl R. Wallace, 138 Lincoln Hall, University of Illinois, Urbana, Illinois.

Personals

John Black, formerly at Kenyon College, is now Professor of Speech and Director of Voice Science at Ohio State University.

Martha Claire Cooper has been appointed instructor in the Speech Department, University of Oklahoma, and clinical audiologist in the Hearing Clinic at the Medical School. She was granted her master's degree from Northwestern University in August. Prior to that she had been on the staff of the aural rehabilitation unit at the Philadelphia Naval Hospital.

Harry Heltman, Professor of Speech and Director of the Speech Clinic, is retiring from the faculty of the University of Syracuse as of June.

Juanita Skinner Hogue is now speech correctionist in the cerebral palsy center at the Riley Hospital. Indianapolis. She replaces Jacqueline Binkley.

Mabel Jean Schmer has been appointed psychologist at Children's Hospital, Columbus, Ohio. In addition to working with speech and hearing problems, she is doing electroencephalography. She recently completed a month's special training at the Johns Hopkins Hospital in electroencephalography.

John Anderson and Melvin Hymen, graduate students at Ohio State University, are working at the Franklin County Cerebral Palsy Center, Columbus, Ohio.

It is with regret that we hear that Marie K. Mason is on leave of absence from Ohio State University because of illness.

Frederic Darley has been appointed Instructor in Speech Pathology at the University of Iowa, where he is in charge of introductory work in clinical practice.

Edwin Shutts, who recently completed his doctorate at Northwestern University, has been appointed assistant professor of speech at the University of Denver and is in charge of the audiology program.

John Gaeth, former Assistant Professor of Speech at the University of Denver, is has joined the faculty of the School of Speech, Northwestern University.

Dorothy Morgan, recently on the staff of Northwestern University and former teacher of the deaf at Elgin, Illinois, is now audiologist for the Crippled Children's Service, Department of Public Health of the State of Delaware.

Alfredo Dub, speech correctionist and audiometrist at the Maciel Hospital, Montevideo. Uruguay, recently completed a series of lectures on speech therapy in the major cities of south Brazil. He was the guest of the Society of Ophthalmology and Otolaryngology of Porto Allegro and the municipality of Pelotas.

Ruth Blatzspieler, former speech correctionist in the Elgin, Illinois Public Schools, is now a speech correctionist, Crippled Children's Service, Department of Public Health of the State of Delaware.

Marian Quinn, former member of the Special Education Department of the Universtiy of Illinois, has gone into private practice in Chicago. She is handling the training problems of the acoustically handicapped.

Spencer F. Brown, M.D., Ph.D., has resigned his position as Associate Professor of Speech Pathology at the University of Iowa in order to work towards the completion of his American Board requirements in pediatrics. He began work as a resident in the Department of Pediatrics at the University of Minnesota Hospital on September 15.

Miss Dorothy Drakesmith has resigned her position as speech correction supervisor in the Webster Groves, Missouri, public schools to become clinical supervisor in the Speech Clinic at the University of Iowa.

Dean Williams has been appointed Assistant Professor of Speech at the Florida State University. His work will be chiefly in speech pathology.

Miss Lucille Cypreanson, Supervisor of the Speech Clinic at the University of Nebraska, is spending a year's leave of absence in doctoral study at the University of Iowa, where she is serving as instructor in charge of the practice teaching program for speech pathology and audiology majors.

Miss Jacqueline Keaster resumed her duties as Assistant Professor of Speech and Otology at the University of Iowa in September, following a year's leave of absence devoted to advanced study and research at the Central Institute for the Deaf and the University of Southern California. Miss Norma Walcher, who filled Miss Keaster's place during her leave, has joined the staff of the Speech Pathology Unit in the Veterans' Hospital, Fort Snelling, Minnesota.

Ellen Spencer has been appointed clinical audiologist in the department of Otolaryngology, School of Medicine, Yale University.

Miss Josephine Simonson is spending a year's leave of absence from the Iowa State Teachers College in advanced graduate work at the University of Iowa. She is serving as speech correctionist for the State Services for Crippled Children at Iowa City.

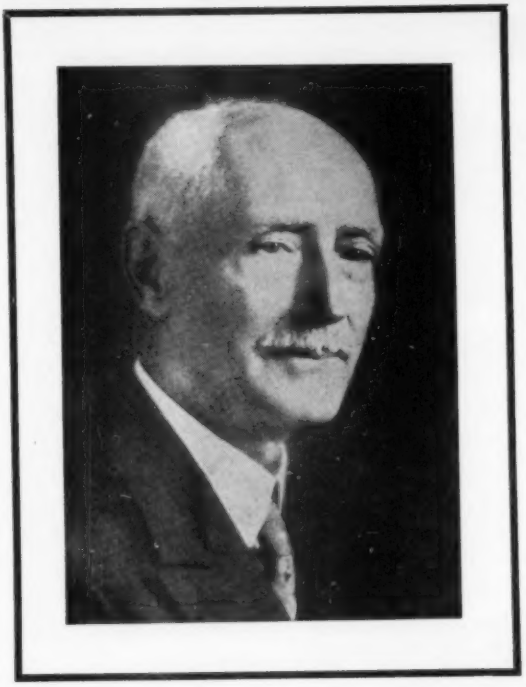
Mrs. Nan Essex has assumed the duties as speech correctionist in the Hospital School for Severely Handicapped Children at the University of Iowa. She replaces Mrs. Sary Wischner, who has accompanied her husband, Dr. George Wischner, to the University of Illinois, where he has joined the staffs in the Departments of Speech and Psychology.

Katherine F. Thorn, who was granted her Ph.D. in Speech Pathology at the University of Minnesota in July, 1949, has accepted a new position as Associate Professor of Drama and Speech and Director of the Speech Clinic at the University of Buffalo, Buffalo, N. Y.

Theodore Hanley has assumed a position of Assistant Professor of Speech at Purdue University. In addition to his instructional duties he will conduct research in experimental phonetics.

McKenzie W. Buck returned to the University of Iowa for further graduate work after serving a year as instructor in the Speech Department at Purdue University and is spending the fall semester on an internship basis working with organic disorders of speech and doing research at the Veterans' Hospital, Knoxville, Iowa.

New assistants in the audiology and speech pathology programs at the University of Iowa this fall include William Tiffany, Clair Hanley, Eleanor Cohen, Leroi Jones, Anne O'Hagan, and James Frick. Miss Dorothy Sherman is continuing as instructor in the Speech Clinic.



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Index

Journal of Speech and Hearing Disorders

VOLUME 14, 1949

Abstracts 72, 181, 275, 385
American Speech and Hearing Association
Convention, 1948, report of 82
Convention, 1949, program outline 194
Convention, 1949, program 289
Anderson, Bernard A. and Knauf, Vincent H. Two ways of increasing the clinical usefulness of a magnetic tape recorder. 37
Aphasia
aphasic patients, prognostic factors related to language rehabilitation in 262
screening test, the Halstead-Wepman 9
Aphonia, diagnosis and treatment of a case of hysterical 312
Articulation
A study of the tendency to resist tongue-tip activity 208
in grades seven through twelve, the effect of maturation on 202
Audibility of the voiceless consonants as a function of intensity. Gilbert C. Tolhurst 210
Audiology, the relationship between clinical psychology and 98
Auditory acuity for pure tones in the waking and hypnotic states. Jerome M. Schneck and Moe Bergman 33
Auditory deficiency and academic achievement. Julie W. Sprunt and Frank W. Finger 26
Auditory malingering, an experimental study for the detection of 119
Bangs, J. L. and Freidinger, A. Diagnosis and treatment of a case of hysterical aphonia in a thirteen year old girl. 312
Beasley, Jane. Techniques of therapy for pre-school children. 307
Bergman, Moe, (See Schneck, Jerome M.)
Berry, Mildren Freburg. Lingual anamolies associated with palatal clefts. 359
Birch, Jack W. (See Matthews, Jack)
Black, John W. Natural frequency, duration, and intensity of vowels in reading. 216
Black, John W. The intensity of oral responses to stimulus words. 16
Bloodstein, Oliver. Conditions under which stuttering is reduced or absent: A review of literature. 295
Book reviews 69, 176, 268, 380
Buck, McKenzie and Harrington, Robert. Organized speech therapy for cleft palate rehabilitation 43
Cleft palate.
Lingual anomalies associated with palatal clefts 359
organized speech therapy for cleft palate rehabilitation 43
Clinical significance of the stretch reflex in speech reeducation for the spastic. Patti Fothergill and Robert Harrington. 353
Clinical use of fiction and biography featuring stuttering. Melba Hurd Duncan 139
Conditions under which stuttering is reduced or absent: a review of literature. Oliver Bloodstein 295
Curry, E. Thayer. A study of the relationship between speech thresholds and audiometric results in perception deafness 104

Curry, E. Thayer. Hoarseness and voice change in male adolescents. 23
Curry, E. Thayer. Voice breaks and pathological larynx conditions. 356

Deaf
Some basic consideration in teaching language to the 247
Home training for deaf children through correspondence 131
Delayed speech
Neurological factors in the etiology of 147
neurological evaluation of 344
Diagnosis and treatment of a case of hysterical aphonia in a thirteen year old girl. J. L. Bangs and A. Freidinger 312
DiCarlo, Louis M. Some basic considerations in teaching language to the deaf 247
Duncan, Melba Hurd. Clinical use of fiction and biography featuring stuttering 139
Duncan, Melba Hurd. Home adjustment of stutterers versus non-stutterers. 255
Dunn, Harriet M. A speech and hearing program for children in a rural area. 166
Duration
Effect of level of distracting noise upon speaking rate, duration and intensity. 363
Natural frequency, duration and intensity of vowels in reading. 216
Dysphonia, rapid repetitive manipulation of the mandible in 260

Effect of level of distracting noise upon speaking rate, duration and intensity. T. D. Hanley and M. D. Steer 363
Effect of maturation upon defective articulation in grades seven through twelve. Helen K. Sayler 202
Eisenson, Jon. Prognostic factors related to language rehabilitation in aphasic patients. 262
Experimental study of tests for the detection of auditory malingering. Glenn J. Taylor 119

Finger, Frank W. (See Sprunt, Julie W.)
Formal call for papers, program committee 92, 97
Fothergill, Patti and Harrington, Robert. The clinical significance of the stretch reflex in speech reeducation for the spastic. 353
Freidinger, A. (See Bangs, J. L.)

Glasner, Philip J. Personality characteristics and emotional problems in stutterers under the age of five. 135
Grossman, Arnold A. and Marcus, Richard E. Otolaryngological experiences in a hearing survey. 240

Halstead, Ward C. and Wepman, Joseph M. The Halstead-Wepman aphasia screening test. 9
Halstead-Wepman aphasia screening test. Ward C. Halstead and Joseph M. Wepman 9
Hanley, T. D. and Steer, M. D. Effect of level of distracting noise upon speaking rate, duration and intensity 363
Harrington, Robert (See Buck, McKenzie)
Harrington, Robert (See Fothergill, Patti)
Hearing aid amplification for optimum speech reproduction. Boyd V. Sheets and LeRoy D. Hedgecock. 373
Hearing loss and intelligibility of selected words, a study of the relationship between measured 111
Hearing survey, otological experiences in a 240
Hedgecock, LeRoy D. (See Sheets, Boyd V.)
Henrikson, Ernest H. and Irwin, John V. Voice-recording—some findings and some problems. 227
Hoarseness and voice change in male adolescents. E. Thayer Curry 23
Home adjustment of stutterers versus non-stutterers. Melba Hurd Duncan 255
Home training for preschool deaf children through correspondence. Harriet Andrews Montague 131

Horowitz, Esther. A study of the tendency to resist tongue-tip activity. 208
Houchin, Thomas D. Notes on organizing a speech correction program in the public schools. 53

Index to Volume 14, *Journal of Speech and Hearing Disorders* 397
Infant speech sound development, the relationship between IQ and indices of 335
Information for contributors to the *Journal of Speech and Hearing Disorders* 93
Intelligibility of selected words, a study of the relationship between measured hearing loss and 111
Intelligibility testing in three conditions involving masking noise. J. C. Kelly and M. D. Steer 369
Intensity
Audibility of the voiceless consonants as a function of 210
Effect of level of distracting noise upon speaking rate, duration, and intensity 363
Natural frequency, duration and intensity of vowels in reading 216
The intensity of oral responses to stimulus words. John W. Black 16
Irwin, John V. (See Henrikson, Ernest H.)
Irwin, Orvis C. (See Spiker, Charles C.)
Irwin, Ruth Beckey. Speech and hearing therapy in the public schools of Ohio. 63

Johnson to Fairbanks. D. W. Morris 14
Johnson, Wendell. An open letter to the mother of a stuttering child. 3
Johnson, Wendell, retiring editor 2

Kelly, J. C. and Steer, M. D. Intelligibility testing in three conditions involving masking noise. 369
Kelly, J. C. and Steer, M. D. Revised concept of rate. 222
Knauf, Vincent H. (See Anderson, Bernard A.)

The Leiter international performance scale—a suggested instrument for psychological testing of speech and hearing clinic cases. Jack Matthews and Jack W. Birch 318
Letter to the editor 175, 265, 311
Lingual anamolies associated with palatal clefts. Mildred Freburg Berry. 359

Magnetic tape recorder, two ways of increasing the clinical usefulness of 37
Marcus, Richard E. (See Grossman, Arnold A.)
Martens, Elise H. Speech and hearing programs as seen by the United States office of education. 162
Matthews, Jack and Birch, Jack W. The Leiter international performance scale—a suggested instrument for psychological testing of speech and hearing clinic cases. 318
Measurement of progress in the correction of articulatory speech defects. Kenneth Scott Wood. 171
Montague, Harriet Andrews. Home training for preschool deaf children through correspondence. 131
Morris, D. W. From Johnson to Fairbanks. 42
Mullendore, James M. The role of surveys and diagnostic clinics in a state program of speech correction. 234
Myklebust, Helmer R. The relationship between clinical psychology and audiology 98
Natural frequency, duration, and intensity of vowels in reading. John W. Black. 216
The neurological evaluation of delayed speech. William G. Peacher. 344
Neurological factors in the etiology of delayed speech. William G. Peacher. 147
News and announcements. 77, 187, 280, 390
Notes on organizing a speech correction program in the public schools. Thomas D. Houchin. 53

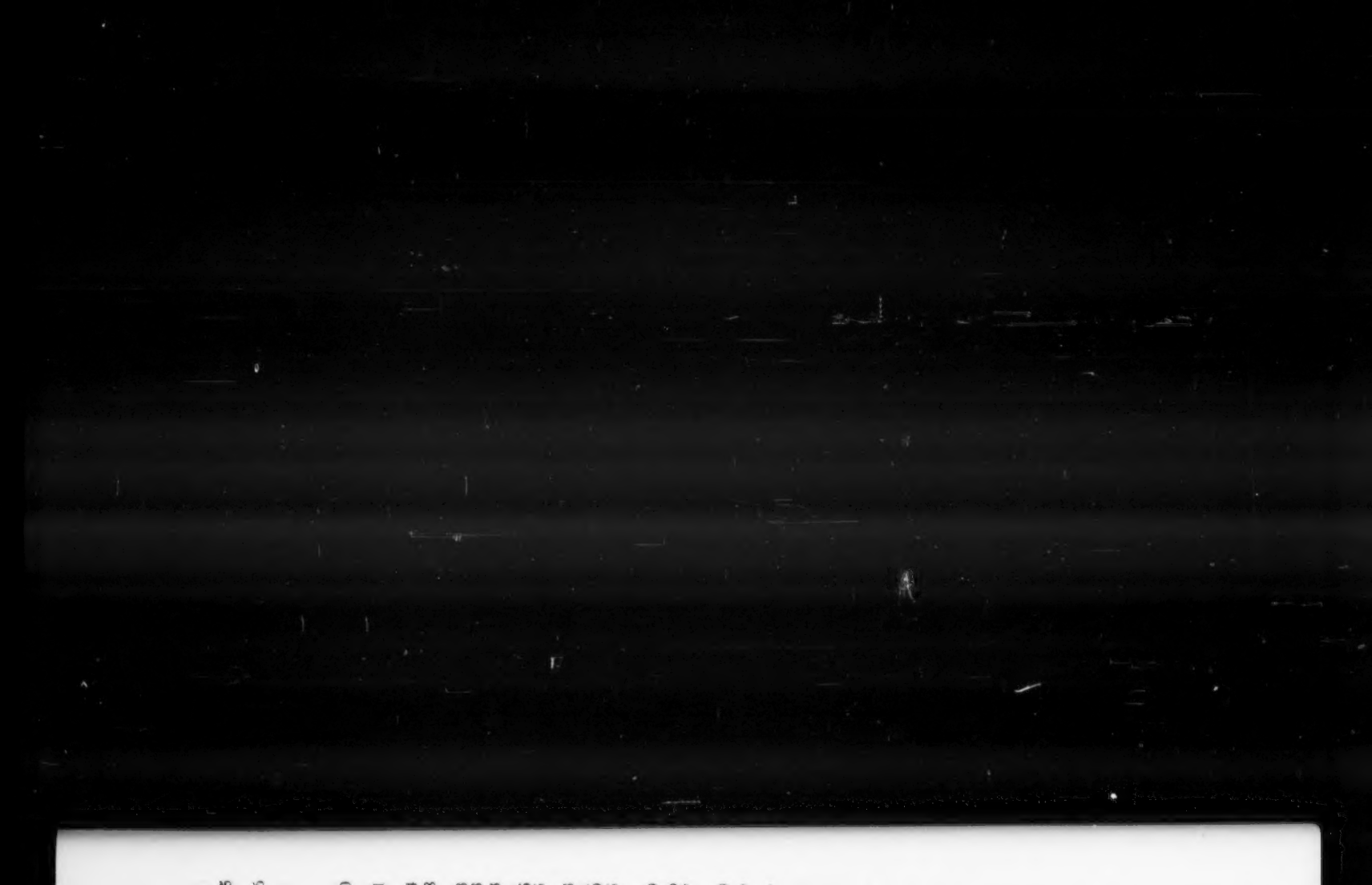
Open letter to the mother of a stuttering child. Wendell Johnson. 3
Optimum speech reproduction, hearing aid amplification for 373

Organized speech therapy for cleft palate rehabilitation. McKenzie Buck and Robert Harrington. 43
Otolaryngological experiences in a hearing survey. Arnold A. Grossman and Richard E. Marcus. 240

Palmer, Martin F., retiring president 1
Palmer, Martin F. Studies in clinical techniques: IV. Rapid repetitive manipulation of the mandible in dysphonia. 260
Pathological larynx conditions, voice breaks and 356
Peacher, William G. The neurological evaluation of delayed speech. 344
Peacher, William G. Neurological factors in the etiology of delayed speech. 147
Perception deafness, a study of the relationship between speech thresholds and audiometric results in 104
Personality characteristics and emotional problems in stutterers under the age of five. Philip J. Glasner. 135
Pre-school children, techniques of therapy for 307
Prognostic factors related to language rehabilitation in aphasic patients. Jon Eisenson. 262
Prostigmin and the chronic stutterer. Howard J. Schaubel and Roy F. Street. 143
Psychological testing of speech and hearing clinic cases, a suggested instrument for 318

Rate
Effect of level of distracting noise upon speaking rate, duration, and intensity. 363
revised concept of 222
Relationship between clinical psychology and audiology. Helmer R. Myklebust. 98
Relationship between IQ and indices of infant speech sound development. Charles C. Spiker and Orvis C. Irwin. 335
Revised concept of rate. J. C. Kelly and M. D. Steer. 222
Role of surveys and diagnostic clinics in a state program of speech correction. James M. Mullendore. 234
Russian and English speech sounds. C. M. Wise 322

SAA study committees, reports of 95
Sayler, Helen K. The effect of maturation upon defective articulation in grades seven through twelve. 202
Schaubel, Howard J. and Street, Roy F. Prostigmin and the chronic stutterer. 143
Schneck, Jerome M. and Bergman, Moe. Auditory acuity for pure tones in the waking and hypnotic states. 33
Schuell, Hildred. Working with parents of stuttering children. 251
Sheets, Boyd V. and Hedgecock, LeRoy D. Hearing aid amplification for optimum speech reproduction. 373
Siegenthaler, Bruce M. A study of the relationship between measured hearing loss and intelligibility of selected words. 111
Some basic considerations in teaching language to the deaf. Louis M. Di Carlo. 247
Spastic, the clinical significance of the stretch reflex in speech reeducation for the 353
A speech and hearing program for children in a rural area. Harriet M. Dunn. 166
Speech and hearing programs as seen by the United States office of education. Elise H. Martens. 162
Speech and hearing programs
as seen by the United States office of education 162
for children in a rural area 166
Speech and hearing therapy in the public schools of Ohio. Ruth Beckey Irwin. 63
Speech correction program
in the public schools, notes on organizing a 53
The role of surveys and diagnostic clinics in 234
Speech improvement in Japan, teaching 196

Spiker, Charles C. and Irwin, Orvis C. The relationship between IQ and indices of infant speech sound development. 335
Sprunt, Julie W. and Finger, Frank W. Auditory deficiency and academic achievement. 26
Steer, M. D. (See Hanley, T. D.)
Steer, M. D. (See Kelly, J. C.)
Street, Roy F. (See Schaubel, Howard J.)
Studies in clinical techniques: IV. Rapid repetitive manipulation of the mandible in dysphonia. Martin F. Palmer. 260
Study of the relationship between measured hearing loss and intelligibility of selected words. Bruce M. Siegenthaler. 111
A study of the relationship between speech thresholds and audiometric results in perception deafness. E. Thayer Curry. 104
A study of the tendency to resist tongue-tip activity. Esther Horowitz 208
Stutterer
Prostigmin and the chronic 143
as he begins his speech therapy, to the 303
To the stutterer as he begins his speech therapy. C. Van Riper. 303
Stutterers
under the age of five, personality characteristics and emotional problems in 135
vs. non-stutterers, home adjustment of 255
Stuttering
child, an open letter to the mother of 3
children, working with parents of 251
Clinical use of fiction and biography featuring 139
Conditions under which reduced or absent: a review of the literature 295
Taylor, Glenn J. An experimental study of tests for the detection of auditory malingering. 119
Teaching speech improvement in Japan. Doris Yoakam Twichell. 196
Techniques of therapy for Pre-school children. Jane Beasley. 307
Tolhurst, Gilbert C. Audibility of the voiceless consonants as a function of intensity. 210
Twichell, Doris Yoakam. Teaching speech improvement in Japan. 196
Two ways of increasing the clinical usefulness of a magnetic tape recorder. Bernard A. Anderson and Vincent H. Knauf. 37
Van Riper, C. To the stutterer as he begins his speech therapy. 303
Voice breaks and pathological larynx conditions. E. Thayer Curry. 356
Voice change in male adolescents, hoarseness and 23
Voice recording—some findings and some problems. Ernest H. Henrikson and John V. Irwin. 227
Wepman, Joseph M. (See Halstead, Ward C.)
Wise, C. M. Russian and English speech sounds. 322
Wood, Kenneth Scott. Measurement of progress in the correction of articulatory speech defects. 171
Working with parents of stuttering children. Hildred Schuell. 251

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